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***JPRS Report—***

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***Central Eurasia***

# Science & Technology

## Central Eurasia

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6 January 1994

**NOTICE TO SUBSCRIBERS—FIRST ISSUE OF NEW REPORT.** This is the first issue of the new consolidated CENTRAL EURASIA: SCIENCE AND TECHNOLOGY report, incorporating nine of the previous ten reports in the series. (The CENTRAL EURASIA: SPACE report remains unchanged and will continue to appear separately.) Each of the nine reports has become a section in this combined report, which also includes TELECOMMUNICATIONS as a new section. From time to time, one or more sections may be omitted, depending on the availability of material. In this issue there is no PHYSICS section. We welcome your comments and plan to survey customers about their changing requirements in the near future. If you wish, you may request additional copies of this report.

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**CIS Nations in Need of Coordinated S&T Policy**  
947A0001A Moscow *PRAVDA* in Russian 29 Sep 93 p 4

[Interview with Boris Yevgenyevich Paton, president of the Academy of Sciences of Ukraine, full member of the Russian Academy of Sciences, and twice Hero of Socialist Labor, by *PRAVDA* correspondent Viktor Drozd, place and date not given: "Academies of All Countries, Unite!"—first paragraph is *PRAVDA* introduction]

[Text] The founding meeting of the International Association of Academies of Sciences (IAAS) was held in Kiev. One of the initiators of its establishment, President of the Academy of Sciences of Ukraine Boris Yevgenyevich Paton, a full member of the Russian Academy of Sciences and twice Hero of Socialist Labor, answers the questions of a *PRAVDA* correspondent.

[Drozd] Boris Yevgenyevich, how do you appraise the policy of Ukraine, Russia, and the other countries of the CIS with respect to science, first of all basic science?

[Paton] The cooperation of labor of scientists of Ukraine, Russia, and the other countries, which were a part of the USSR, is very significant. This cooperation enriched world science with outstanding achievements and discoveries. The harm, which is being done today to science in our countries under the conditions of the growing economic crisis and is hard to compensate for, is all the more perceptible. Creative collectives and traditional ties, which were established by the efforts of scientists of several generations, are disintegrating, the scale of basic research in the most promising, vitally important directions is decreasing. This then and there resulted in a substantial decrease of the overall level of scientific research, affected the quality of the training of scientists and scientific and technical personnel, and caused irreversible consequences in the entire system of education. Today the governments are no longer able to finance properly even the most prestigious research institutions that are concentrated in the academies of sciences. Hence the mass "brain drain."

All this represents an unmistakable threat to the national interests of Russia, Ukraine, and the other sovereign states and is fraught with the most serious consequences for the intellectual potential of our peoples. For, as the great Pasteur noted, science should be the most sublime incarnation of the homeland. At all times in the most developed countries scientists enjoyed special attention and privileges. Precisely the labor of scientists promoted the economic and social progress of these states. It is appropriate to mention that in the five most developed countries (the United States, Japan, Germany, Great Britain, and France) the financing of science per scientific worker came in 1992 on the average to \$130,000—several hundredfold more than in our countries. Such a situation threatens us with chronic backwardness and the irrevocable loss of previously gained leading positions in world science.

[Drozd] What must be done to correct the situation?

[Paton] It is necessary to formulate quickly a goal-oriented technological strategy, which has been coordinated with the program of the structural reorganization of industry

and the conversion of the defense complex and with economic organizational transformations. Further it is necessary to increase state support of basic research and to develop the innovation process. To form what is called "firm" science, to establish large state sectorial and inter-sectorial scientific and technological centers in priority directions, and to ensure the rapid transfer of technologies between the civilian and military spheres.

All this should be provided for in the state concept of scientific and technical policy. Ukraine, Russia, and the other countries, which have come into being on the territory of the USSR, thus far do not have such a concept. The efficient coordination of the structures of the state management of the scientific and technical sphere and the financial support, which is independent of them, of priority basic scientific research are needed.

[Drozd] Will the established association, apparently, serve the restoration of the intellectual potential and broken scientific ties?

[Paton] The scientists of the academies of sciences of the republics, which were a part of the USSR, are sincerely interested in the continuation of cooperation that is based on the community of a large number of scientific schools. International experience also confirms that progress in science is impossible both without the narrow specialization of scientists and without the integration of sciences. The role of science and scientists in the establishment and strengthening of a favorable climate of interrelations among states is also indisputable. That is why the aspiration to preserve the jointly produced scientific potential is inducing people to specific actions. One of them is the uniting of leading scientists in the International Association of Academies of Sciences.

[Drozd] In what will the activity of the association consist?

[Paton] The concept of the association in the process of its formulation and discussion changed, subject to the political situation. And this is understandable. The changes in the state structure and the profound crisis of national and economic relations, by which the countries that were a part of the USSR were affected, are also affecting the sphere of science. It is therefore exceptionally important to create precisely now such conditions for the cooperation of scientists of the sovereign states, which would make it possible to use effectively the common intellectual potential.

Of course, the IAAS neither in its goals and functions nor in the nature of its activity will be any administrative superstructure over the national academies of sciences. Each of them (and not just those from the countries of the CIS) in its activity is completely independent of the association and is guided by its own charter and the legislation of its state.

The basic work of the association will be concentrated in permanent and temporary committees for fields, directions, and the most important problems of science, which can be established at scientific centers that hold a leading position in their field. Fundamentally important questions

of the development of basic science will be discussed at sessions of the general assembly or at conferences of the association.

[Drozd] What assets will the IAAS have? Who will finance it?

[Paton] It is proposed to carry out the financing of the IAAS both by means of subsidies of the association members themselves and by means of expert and scientific consulting activity and charitable contributions.

[Drozd] How many national academies of sciences were founders of the association?

[Paton] The establishment of the IAAS has now been supported by 12 countries of the former USSR. The republics of the Baltic region have expressed interest in cooperating with the association after its establishment. The Academies of Sciences of Vietnam, Slovakia, and the Czech Republic are also among those who signed the agreement on the establishment of the Association. The last two did so as observers. Representatives of the international scientific community: Sir Arnold Bergen, president of the Academy of Europe, and Prof. Mohammed Hassan, executive secretary of the Academy of Sciences of the Third World, also took part in the founding meeting of the IAAS. The agreement on the association is open for signing by the academies of sciences of other states.

#### Conference Discusses OECD Document on Russian S&T Policy

947A0002A Moscow DELOVOY MIR in Russian  
30 Sep 93 p 4

[Article by DELOVOY MIR commentator Igor Krylov under the rubric "Examination": "Russian Science Through the Eyes of European Specialists"—first paragraph is DELOVOY MIR introduction]

[Text] The international conference "The Science and Technology and Innovation Policy of Russia" was held at the Russian Academy of Management. Two voluminous documents, which analyze in detail the situation in Russian science: the "Base Report" (more than 200 pages of text), which was prepared by an expert group of the Ministry of Science and Technology Policy of Russia, and the conclusion based on it—what is called the "Evaluation Report" (67 pages of text), which was written by experts of the Organization for Economic Cooperation and Development (OECD)—were discussed.

The OECD traces its history back to 1948—the organization was established for the purpose of restoring the war-ravaged European economy on the basis of the Marshall Plan. Today the 24 most industrially developed countries of the world are the members of the OECD. More than 20 committees belong to the structure of the organization. An expert group of one of them—the Committee for Scientific and Technical Policy—performed to the order of Russia much evaluation work.

In the summer of last year the Ministry of Science and Technology Policy addressed to the OECD the request to

conduct a survey. The examination was necessary for the objective distribution of western financial aid and adjustments of the scientific and technical policy of Russia.

According to the assessment, which Minister of Science Boris Saltykov gave at a press conference, the conclusions of the examination of the OECD for the most part confirmed the correctness of the policy being pursued by his department, the "Evaluation Report" does not contain any particular surprises for him, while many of the recommendations of the OECD have already begun to be used in practice. "The process is even more important than the result" is how the minister expressed himself.

Thus, what are the basic recommendations of the examination of the OECD and how did the participants in the representative world scientific forum (in addition to Russian specialists delegations of 19 OECD member countries and eight international organizations participated in the conference) appraise them? For precisely these recommendations will be of fundamental importance for western foundations, banks, financial groups, and firms when implementing various projects for the support of Russian science.

The first thesis that is heard persistently in the "Evaluation Report" is that the scientific potential of Russia is its second national wealth after raw material resources. But the structure of science is extremely distorted and "excessively overweighted" by the defense, space, nuclear, and machine building complex. This structure is absolutely unsuitable for a market economy, and for this reason the OECD's examination concludes that the decrease of the number of people employed in science and scientific service by two-thirds is inevitable. Calculating the real possibilities of Russia in the maintenance of scientific personnel, the report names 300,000 people. OECD experts recommend reductions first of all at the expense of technical and administrative personnel, as well as inefficient sectorial science.

The Russian Federation Ministry of Science and Technology Policy did not agree that there are still too many scientific personnel in Russia, and specified its policy in the following thesis:

"To halt the further destruction of the scientific potential, to cultivate new structures alongside old ones." However, here it was admitted that sectorial science needs significant institutional reorganization and market reorientation.

This evaluation was confirmed by data of Russian specialists. Thus, the following facts from the "Base Report" were cited in the statement of Nadezhda Gaponenko, chief of the department of scientific policy and forecasting of the Center of Research and Statistics of Science: No more than 10 percent of sectorial science is capable of working at the world level, no more than 5 percent of the assets being invested in it lead to the development of innovative technologies. At the same time sectorial scientific research institutes in the number of personnel and expenditures make up more than 70 percent of the entire research infrastructure.

The second most important thesis of the "Evaluation Report" is that the mechanism of the management of science, which exists in Russia, is inefficient due to the lack of unified monitoring of the distribution of budget allocations. The OECD experts gave a negative assessment to the removal from the Ministry of Science and Technology Policy of the functions of the supervision of the higher school, which took place at the beginning of 1993, and to the removal of Boris Saltykov from the post of vice premier. Representatives of the Ministry of Science and Technology Policy also acknowledged this, having spoken about the return in 1993 to the old system of the formation of the budget of science, in case of which the Ministry of Defense, the Ministry of Atomic Energy, the Russian Space Agency, the State Committee for Industrial Policy, the RAS [Russian Academy of Sciences], and so on determine a large portion of it. Under the conditions, when the Ministry of Science and Technology Policy actually controls only a small portion of the budget of civilian science, the monitoring of the effectiveness of the use of assets is impossible. Consequently, as compared with 1992, when the Ministry of Science and Technology Policy controlled the science budget entirely, the chances of Russia to attract western investments to this sphere have worsened significantly.

Estimating the amounts of foreign investments in Russian science, the report names a figure of \$500 million (of it approximately half is along the lines of state programs, the other half is investments of private firms). The OECD experts rate very pessimistically the prospects of subsequent private investments in this sphere: "Russian scientific organizations understand cooperation as an exercise in the obtaining of aid that is intended for the maintenance of the existing structure of science, while private business of the OECD countries is seeking projects that are of mutual interest." So that the report recommends that the directors of scientific research institutes (and first of all sectorial scientific research institutes) seek financing from their colleagues in domestic industry. For the present the OECD experts have estimated the contribution of industry to the financing of research and development in the total amount of expenditures at less than 5 percent. Such a situation, in their opinion, is irrational and inefficient. In no country of the world will the state budget be able to provide all scientific and technical financing.

At the same time there are areas that were rated at top-priority ones for western financing. First of all these are the acquisition of foreign scientific literature and the subscription to journals. The report states indignantly that instead of the allocation of \$12 million for subscription in currency, which were envisaged by the 1992 budget, the libraries of the RAS received from the USSR Academy of Sciences an "heir's debt" of \$175 million.

Other priority spheres are aid to Russian scientific centers with instruments and equipment, materials and agents for experiments and the establishment of telecommunications systems. The state of the scientific museums and libraries of Russia with unique collections aroused particular concern of the OECD experts—their affairs are so deplorable that the report demands the quickest financial aid for urgent rescue measures.

In evaluating the programs of aid to Russian basic science, the report dwells first of all on the successes of the Soros Foundation, which is distributing \$100 million among 25,000 selected scientists. According to the estimates of the OECD experts, western investments already come to about 30 percent of all Russian funds for science, including its military sector, which is an exceptionally important lever of influence on research themes.

The OECD experts do not dramatize the problem of the "brain drain," estimating its scale by the figure of on the order of 30,000 specialists—this is 10-15 percent of the total losses that have been incurred by the sphere of science in the last three years. For the solution of the problem the "Evaluation Report" recommends summer seminars of young scientists and programs of the practical training of those with undergraduate degrees and graduate students at western scientific centers. The experts believe that given guarantees of regular trips abroad, talented Russian scientists will remain in the country and will acquire enormous psychological support, while constantly working together with western colleagues.

The report rates very critically the situation in the area of the social sciences, not seeing prospects of a demand for social scientists either in Russia or in the West. The OECD experts believe that the social scientists, who received training in the USSR, were simply deprived completely of humanities knowledge in its worldwide understanding, and only a few are capable of adaptation.

The innovation part of both the "Base Report" and the "Evaluation Report" is most poorly developed, which was repeatedly noted by the speakers: Mikhail Tsimbalov, chief of an administration of the Committee for Patents and Trademarks, Dmitriy Piskunov, director of the analytical center of the Ministry of Science and Technology Policy, and others. This lack of development is connected in many respects with the lack of the necessary statistical data on the sphere of innovative activity, about which Prof. Yury Yakovets, head of a chair of the Academy of the National Economy, spoke bitterly.

As a whole the report notes that, in spite of the introduction of a package of laws on the protection of intellectual and industrial property, in Russia the questions of the reliable protection of the rights of patentees have not been settled, thus far the Patent Court has not been set up. The OECD experts note that the resources and finances, which are being allotted from the budget of the Committee for Patents and Trademarks, are obviously inadequate for the accomplishment of urgent tasks and the bringing of the new Russian patent system "out of its infancy."

Among the other obviously undeveloped items of the technical policy of Russia the OECD experts noted the uncontrolled destruction of such most important units of the scientific and technical infrastructure as the system of certification, standardization, and scientific and technical information. The process of the privatization of institutions of the scientific sphere, according to the data of the "Base Report," is at the initial stage—37 scientific organizations have been privatized. In the opinion of the experts of both

Russia and the OECD, people are continuing, alas, to carry over mechanically the forms and methods of privatization from the sphere of physical production to privatization in science. The procedural questions of the evaluation of intellectual property in the process of privatization have also not been settled. The "Evaluation Report" demands that Russia establish precise norms—what can be privatized in the scientific sphere and what is "inalienable public wealth" that is not liable to privatization.

In evaluating as a whole the recommendations and conclusions of the OECD experts, it is merely possible to state that Russian science (with the exception of individual most advanced areas of basic research) can hardly count on major western investments, particularly from the private sector. I am certain that the main benefit of the performed expert work for the team of first-class professionals, which the leadership of the Ministry of Science and Technology Policy is forming around itself today, also consists precisely in this. At any rate, Minister Boris Saltykov stated firmly and unequivocally: "The recommendations of the OECD are very useful, but we are obliged to form our own scientific and technical policy."

### Russian Antarctic Research Justified

947A0003A Moscow *IZVESTIYA* in Russian  
9 Oct 93 p 15

[Article by journalist Pavel Zybin: "Do We Need Antarctica?"—first paragraph is *IZVESTIYA* introduction]

[Text] With the arrival of autumn, when the time to send the next Antarctic expedition on its way is coming, many people are asking themselves this question over and over again. Is it not too great a luxury for the country, whose economy is experiencing far from the best of times, to allow itself such expensive projects?

In the words of Valeriy Kalatskiy, first deputy chief of the Federal Service of Russia for Hydrometeorology and Environmental Monitoring, even from a purely economical standpoint it is necessary to preserve the Russian scientific stations in Antarctica.

Such enormous work has now been done that for Russia it is more advantageous to complete it and not to give it up and then start all over again. At the Vostok continental station a hole 2,751 meters deep has already been drilled, unique scientific data, the value of which it is difficult to overestimate, have been obtained. So much money has already been invested in this project that if the station is shut down, the losses will prove to be greater than the assets which it remained to invest.

This year Rosgidromet [the Federal Service of Russia for Hydrometeorology and Environmental Monitoring] is not receiving the full financing of the expedition. However, life is making it incumbent to enter the market, scientists are not only going about with an outstretched hand. In accordance with bilateral understandings with the United States it is succeeding in financing in part the research in Antarctica. Another two intergovernmental agreements with Chile and Italy on the conducting of research in Antarctica

with the use of the Russian scientific and material potential have now been prepared. It is a matter, first of all, of the Vostok station—one of two that are located in the center of Antarctica. These agreements are making it possible to partially finance the expedition. And nevertheless there is not enough money, because financing is being carried out with a delay. The prices for fuel, for example, have increased by nearly tenfold, while the indexing of expenditures is being carried out with a coefficient of 1.8.

Now five operating stations out of eight remain. But it is necessary to recover somehow from the situation. If in the immediate future it is not possible to settle the question of financing, the Vostok station will have to be shut down, inasmuch as there is practically no fuel left there. Precisely the question of the delivery of fuel is now "bringing to a standstill" the entire expedition.

But Vostok is a unique station. If we lose it, we will lose not only the material support of foreign partners, but also scientific data, which are so necessary. Work is being performed here under the ozone layer monitoring program, the deep drilling of the glacial cover, which here is nearly the greatest on earth, is being carried out.

These data are necessary for the making of a forecast, on the basis of which decisions on the reaction of the decrease of the ozone layer and the change of the climate, behind which lie enormous material expenditures on the scale of the country, will be made at the state level. But this is not so much a scientific question as it is an economic one.

One must also not forget that as a result of geological research in Antarctica mineral deposits were discovered. To ignore this means not to care about the future, to say nothing of the international obligations of Russia and our prestige.

### Latest on Russian, CIS Patent Situation

947A0004A Moscow *DELOVOY MIR* in Russian  
5 Oct 93 p 5

[Interview with Vladimir Vladimirovich Belov, deputy chairman of the Russian Federation Committee for Patents and Trademarks, by *DELOVOY MIR* commentator Igor Krylov, under the rubric "Innovations"; place and date not given: "The Patent Situation in Russia"—first paragraph is *DELOVOY MIR* introduction]

[Text] On 1 September new amounts of the patent fees were introduced in Russia. But last week in Uzhgorod (Western Ukraine) delegations of the CIS countries held talks on the prospects of the creation of a common CIS patent and an interstate patent office. These events—extremely important ones for the development of the innovation process—were at the center of the conversation of *DELOVOY MIR* commentator Igor Krylov with Vladimir Belov, deputy chairman of the Russian Federation Committee for Patents and Trademarks.

[Krylov] Vladimir Vladimirovich, first of all about the main parameters of the situation: How many applications for patents, useful models, and trademarks are people now submitting?

[Belov] Last year yielded 34,000 applications for patents, this year we expect not less than 40,000. The decline has halted, and invention activity has gone up, though slowly for the present. From foreign firms 2,313 applications were received, 9,515 were received from the republics of the CIS. The breakdown of the granted patents of Russia is also noteworthy—legal persons receive about 60 percent, inventors themselves receive the remaining 40 percent. As a whole this approximately corresponds to world practice.

As is known, the patent law of Russia introduced a deferred system of examination, but nearly half of the applicants do not use it—they submit a petition for the conducting of a full examination at the same time as the application for a patent. In world practice on the average not more than a fourth of the applications are submitted with such petitions. Here, I think, a certain inertia of the thinking of our patent experts and the lack of a habit for the deferment of the examination for the present are working. Many applications, incidentally, contain the request to speed up the publication of the patent and to give it earlier than the 18 months that are envisaged by the law. As a rule, this is connected with the patenting of an invention abroad and other requirements of its quickest commercialization—advertising, participation in exhibitions, and others.

The number of applications for trademarks for several years now has been increasing steadily—in 1992, 29,000 of them were submitted, the annual increase came to 12.5 percent. Russian applicants submitted 17,000 applications, 4,000 were submitted from countries of the CIS, 12,000 were submitted from remote foreign countries. Incidentally, Ukraine yields on the order of 80 percent of the applications for trademarks and 60 percent of the applications for patents from nearby foreign countries. Is this not evidence of the close interweaving of our economies?

In 1992, 2,730 applications for industrial designs were submitted, and the tendency for the protection of this important type of industrial property to decline thus far, unfortunately, has not been overcome. The legal protection of useful models was introduced with the coming into force of the new patent law—on 14 October 1992. On 1 September 1993 about 100 applications had been submitted. Apparently, applicants for the present are taking a close look, but I link precisely with useful models the hopes for the increase of invention activity. According to my predictions, in the future not less than half of the applications for new technical solutions will be received precisely for useful models.

[Krylov] Do you foresee difficulties in the process of the examination of useful models and the consideration of disputes about the legitimacy of the granting or the violation of a patent for a useful model? For the procedure of the examination of a useful model, as is known, is at sight—they grant a patent “at the risk” of the applicant, without guarantees.

[Belov] Indeed, conflicts and disputes about the validity of a patent for a useful model are possible. We do not forecast too many misunderstandings with regard to useful models. But nevertheless we are developing a procedure of their

examination before taking them to court. That is, before the submission of an objection to the Appellate Chamber the interested parties will be able together with an expert to determine the conformity to the criteria of patentability of the granted patent for a useful model. But as a whole, as I have already said, we do not expect many such disputes—the term of the legal protection of a useful model is only five years, while the fees for them are lower than for patents for inventions.

[Krylov] It may, perhaps, interest many people, why they established the patent fees in fixed amounts, when there is hyperinflation outside. After all, at the State Motor Vehicle Inspectorate and so on today they take many fees and fines on the basis of the amount of the minimum wage.

[Belov] The point is that the maximum term of effect of a patent is 20 years, while during this time the minimum wage will be revised so many times.... How is one to calculate the fee? On the basis of the minimum wage for the year of priority, or the granting of the patent, or the making of a specific payment?

Moreover, several republics within the Russian Federation have their own minimum wage norms, which differ from federal norms. As a whole I believe that it is necessary to allow the applicant to work under the conditions of stable patent fees, in spite of the complete instability of the ruble. No one here ever calculated how much revenue patent fees can yield, to what extent they are capable of covering the work of the patent office.... Everything went to the state budget. Now the question of the division of patent fees is constantly arising during the discussion of the questions of the establishment of the Interstate Patent Office of the CIS. Armenia, for example, is demanding for itself 100 percent of the patent fees....

There is another urgent thing: The model of the patent convention of the CIS, which is being discussed today, differs from the European model or the model of the Agreement on International Patent Cooperation. The applicant, who submitted an application for a CIS patent during the first year, does not have the right to choose—he should pay the patent fees in all the countries that are parties to this agreement. In general talks on any patent problems of the CIS member countries proceed slowly and with difficulty. The main result of the meeting held in Uzhgorod was the fact that we arrived at a preliminary agreement—30 percent of the patent fees go to the budget of the Interstate Office, the rest goes to the member countries.

The main problem today consists in the fact that all the partners to the talks without exception believe: Russia personally should advance all the expenses on the establishment of the Interstate Patent Office. They substantiate this by the inheriting by Russia from the USSR of the property of the former State Committee for Inventions and Discoveries.

[Krylov] The fact that any property and financial talks of the CIS member countries proceed with extreme difficulty, is not surprising. But still is there a convergence of positions? What has changed in the positions of your colleagues from the young patent offices of the states of the CIS?

[Belov] I would say that the period of patent euphoria has ended. They actually understood all the labor intensiveness and complexity of patent work. Today the complete lack in the patent offices of the CIS countries of any patent statistics is greatly complicating the work. And this is when there are still few applications and it is quite easy to count them.... We, incidentally, since 1992 have been putting out an annual report of the Russian Federation Committee for Patents and Trademarks, which has been completed in accordance with all international standards of patent statistics. For without clear knowledge of the patent situation in its own country any patent office simply cannot operate.

### Negative Aspects of Western Aid, Investment Discussed

947A00064 Moscow ROSSIYSKIYE VESTI in Russian  
20 Oct 93 p 2

[Article by Stanislav Simanovskiy, Yuriy Naido; "SOS: limit of decline reached" under the rubric: "Current Interview"; first sentence is bolded subhead]

**[Text]** The process of undermining national technological security has reached a limit beyond which it takes on an uncontrollable character.

Raw material and the intellect - these are the basic wealth of our Fatherland which, at the present historical juncture, are the only basis of social-economic transformations. Much is said and written about raw materials. The intellectual resource, of course, also is of colossal economic potential. If it is not to be lost...

However we are losing it. Expenditures for science at the beginning of 1980s were 4.5-4.7 percent of the national income; in the past and current years they are about one percent. And, the national income itself has dropped. The technical armamentarium of national science which, even without this fact, constitutes just a little more than 1 percent of the U.S. level, continues to fall. The average salary of a scientist here is approximately half that in industry; in America the proportion is the reverse. A substantial number of our more highly qualified specialists are emigrating. Thus, in the NASA system alone (USA) more than 100 of our former citizens are engaged in space-related research. In Israel 90 percent of military-industrial complex specialists are former Soviet citizens. In France, 30 percent of mathematics teachers hired in the universities in the past year are Russian.

All these are merely particular facets to the dangerous process which is already turning into a catastrophe for Russia.

National technological security is an integral part of a more general concept, the national security. A clear definition of the latter remains to be developed on the basis of a formulation of contemporary and future national state interests of Russia. However, the alarm must be struck quickly in the case of an obvious threat to these interests. Otherwise, no formulations at all will be needed.

The task of ensuring technological security can be represented as a system of measures directed toward the maintenance of the maximally achievable level of the development of the domestic scientific-technical and production potential given any development in the international situation. This refers to a level which would guarantee the survival of the national economy through our own intellectual and technical resources, which would guarantee its defense adequacy and economic independence. The most evident signs of the breakdown of the country's technological security is the disintegration of the national scientific and technical potential and the formation of a one-sided technological dependence on the more developed Western countries. Today Russia is experiencing the influence of both of these factors. Moreover, there is on hand a process of intense disintegration of Russia's scientific-technical potential in the form of the erosion of its personnel component, brain drain, deterioration of the material-technical and information base of science, the lack of demand for scientific and technical achievements, etc.

Domestic science and technology, in particular, have been placed in circumstances in which their further development has begun to a substantial degree to depend on Western material and financial assistance. However, even with the outwardly entirely positive role of this assistance, it even now carries within itself the anlagen of further disintegration of national technological security.

Analysis of the forms and methods of the rendering of financial and material support to Russian science by the West (the amount of the help, both actually furnished as well as promised, amounts today to nearly half a billion dollars, or almost 500 billion rubles at today's dollar exchange rate) shows that, apart from a large number of positive factors, it also has definite negative consequences.

Above all, the system of information collection itself, concerning scientific developments, institutions, and research personnel for the submission of applications to receive grants and other forms of assistance from foreign organizations (scientific establishments, funds, international organizations, etc.), offers the West the possibility of possessing an exhaustive notion of the contemporary state and problems of the development of the Russian scientific-technical potential, to a degree of knowledgeability that Russian governmental bodies responsible for the development of domestic science and technology do not have.

It seems appropriate to point out that by now more than 10 different funds have been established in the West for the support of science in Russia and the other countries of the CIS. Among these are the well-known Soros Fund (USA), which has allocated \$100 million to the countries of the Commonwealth for 1993-1994, the National Science Fund of the USA (\$25 million), the McArthur Foundation (\$3 million), and the Mitterand Fund, a general European fund (4 million ECU).

The detailed knowledgeability regarding our potential enables the West to identify the most promising lines of research and the most qualified and productively working scientific personnel for their later use in one form or another in the interests of the development of Western science and technology, and economy as a whole. The financing of the work of individual Russian scientists and of scientific collectives through the system of foreign

grants and other forms of assistance, the provision of contemporary research equipment, instrumentation, and materials, and other forms of aid to the general extent indicated above, which is also comparable to the extent of domestic financing of Russian science (680 billion rubles in 1993), have yet another negative aspect. This offers the West the possibility of destroying a substantial portion of the scientific-technical potential of Russia from the solution of urgent national economic scientific and technological problems confronting it, thus creating in our country a peculiar sector serving the needs of the Western economy. In truth, whoever pays the piper calls the tune.

Moreover, the possibility arises of the closing down of particular lines of development of Russian science and technology, even of blocking them, especially in those fields in which the particular achievements might prove competitive on the world market for the industrial products prepared on their basis.

Due to the substantial (up to 60-100-fold) difference in the pay of the Western and the Russian scientist, the West thus saves a great deal of money for science. On the other hand, the receipt by Russian scientists and specialists of currency from Western grants and other assistance leads to social tension in scientific collectives, and places scientific establishments and institutes under obviously unequal conditions. In their race for currency wages, given the acute deficit in domestic investments in science and technology, many scientists and whole scientific collectives are ready to sell scientific and technical achievements abroad for nothing, which in a number of instances exceed the world level and which constitute a genuine national property of Russia.

The latter phenomenon is especially dangerous in the sphere of the military-industrial complex, since it is directly related to the weakening of the country's defense potential. This practice has become very noticeable recently; however, measures for its control had not been worked out. In fact, the transfusion to the West of a substantial portion of Russia's national wealth is taking place without equivalent compensation.

It must be stated, regrettably, that the question of Russia's technological security has somehow fallen from the field of view of the country's leadership. The blunder that has been permitted, which is of strategic significance, must be eliminated as fast as possible, since the process of undermining the national technological security has reached a limit beyond which it takes on an uncontrollable character.

From our point of view, the core of the preservation and strengthening of Russia's national technological security under the new conditions must be the principle of equal technological dependence of the partners in international collaboration, to be formed exclusively under the conditions of international scientific-technical cooperation.

This principle presupposes the openness of Russian scientific-technical potential to the outside world, and rejection of autarchy, which corresponds to the spirit of economic reform, Russia's interests, and the interest of the international community. We have in mind also the equivalence of the potential damage to the partners in case of a rupture in

international technological relations. There is a stake in the guarantee of an even-handed, synchronized technological development of the participants in international collaboration, which excludes the possibility of their lagging markedly one behind the other or of one outstripping the other.

The reality is such that the preservation and growth of the scientific-technical potential of our country is possible only given the provision of the optimal combination of internal and external sources of influence. External factors will probably be predominant in today's conditions. However, Western aid in its various forms should not simply be welcomed, but the appropriate mechanism for its most effective acquisition, distribution, and use in the interests of Russia should also be created.

The viability of domestic science, and consequently, the technological security of Russia can and must be achieved through our own efforts, through the mobilization of internal sources and reserves, above all through broad state support of a national scientific-technical potential. It is advisable above all to strengthen the legal foundation. For this purpose a package of laws should be adopted regarding scientific-technical policy, the scientific academies of Russia, the academic scientific institution, the status of the scientific worker, and the protection of intellectual property, state and other secrets. An ensemble of legislative and normative acts, regulating the process of brain drain both from Russia abroad and from the countries of the former USSR into Russia is also required.

It would make sense to create a data bank on Russian scientists and specialists (including undergraduates and graduate students) who would be able to go abroad for possible on-the-job training or contract work. A data bank on Russian technologies of interest for potential foreign partners is also a practical necessity, with the aim of possible commercial sale without harm to the country's security. It is evident that this logically presupposes also the creation of an interdepartmental authority (similar to the existing Gostekhkomissiya [State Commission for New Technology], but expanding and supplementing its function) to control the process of the transfer of Russian technology abroad for temporary or permanent operation, a kind of Russian COCOM [Coordinating Committee].

It seems advisable to organize on a comprehensive basis the coordination of the efforts of the international community to offer assistance for the preservation and development of the Russian scientific-technical potential. Such coordination would include also the creation of an international information system in this sphere, of a unified financial fund or bank, and of an insurance company. All this would make access to external sources of financing simpler and socially fair in the interests of all of Russian science, and not of an isolated portion of it.

**From the Editorial Board.** *Yuriy Grigorevich Naido is the Director of the Center of Structural Investigations and Industrial Policy of the Institute of International Economic and Political Research of the Russian Academy of Sciences; Stanislav Iosifovich Simanovskiy is the Chief of the Sector of Innovation and Industrial Policy of the same Institute.*

## CHEMISTRY

**Possibility of Synthesis of Actinoid Clusters of Composition  $An_2Cl_3$** 

937M0174A St. Petersburg RADIOKHIMIYA  
in Russian Vol 35 No 3 May-Jun 93 (manuscript received 17 Nov 92) pp 1-2

[Article by N. B. Mikheyev, S. A. Kulyukhin, and A. N. Kamenskaya; UDC 621.039.337+546.799]

[Abstract] Previous work on the possibility of obtaining  $M_{22}Cl_3$  actinoid clusters showed that all bivalent actinoids having an electron configuration of  $[f^n-1d^1]^{2+}$  are capable of co-crystallization with  $Gd_2Cl_3$ , and the possibility of individual actinoid cluster synthesis was demonstrated. However, attempts of such synthesis by classical means proved unsuccessful. Other attempts by electrochemical means also proved unsuccessful. In the present work, an attempt of  $An_2Cl_3$  cluster synthesis (where  $An = Th, U$ , and  $Np$ ) from melts resulted in reduction to the metallic actinoid, and it was concluded that actinoid cluster synthesis from melts is not possible by this method. References 6: 3 Russian, 3 Western.

**Preparation of  $Gd_2Cl_3$  Cluster From Homogeneous Melt**

937M0174B St. Petersburg RADIOKHIMIYA  
in Russian Vol 35 No 3 May-Jun 93 (manuscript received 2 Sep 92) pp 3-4

[Article by N. B. Mikheyev, S. A. Kulyukhin, and L. N. Auerman; UDC 621.039.337]

[Abstract] All lanthanides and actinides starting with protactinium may exist in a homogeneous melt in the 2+ oxidation state. When the stabilization energy of the d-level exceeds the energy of f-d-excitation, the f-elements are characterized with participation of d-electrons in the chemical bond. These elements include the lanthanides and Y. The presence of a d-electron in the valency orbital is a required condition for formation of a condensed cluster, such as  $M_2Cl_3$ . The classical method for this synthesis is based on the reaction of the metal with the tri-chloride in a melt. However, a basic factor inhibiting this reaction in the case of  $GdCl_3$  is the fact that the  $Gd_2Cl_3$  cluster is not thermally stable at temperatures above 923 K, while most di- and tri-chlorides have melting points considerable higher than this value. It then becomes necessary to add an inert component to the melt which has a melting point lower than 923 K, such as  $LiCl$  (m.p. = 879 K). In the present work  $GdCl_3$  was reduced with divalent lanthanide in a homogeneous melt containing  $NdCl_2$  or  $DyCl_2$  at 888 K. After 25 hours the  $Gd_2Cl_3$  cluster is formed. This type of reduction does not take place in the presence of  $TmCl_2$ . References 10: 5 Russian, 5 Western.

**Experimental Check of Possible Methods for Preparation of Curium (VI)**

937M0174C St. Petersburg RADIOKHIMIYA  
in Russian Vol 35 No 3 May-Jun 93 (manuscript received 10 Dec 92) pp 5-6

[Article by V. P. Shilov and A. B. Yusov; UDC 546.799.6]

[Abstract] In a previous work it was demonstrated that curium can exist in the hexavalent state. Where micro-quantities of this substance were sufficient for the proof of valency, larger amounts of curium (VI) are needed for purposes such as (VI)/(V) pair potential, absorption spectra, states of existence, etc. In the present work an attempt was made to oxidize curium (III) in solutions of sodium carbonate and bicarbonate saturated with  $N_2O$  and treated with  $\Gamma$ -radiation from  $Co^{60}$ . It was assumed that oxidation of curium (III) to curium (IV) would lead to disproportionation to form curium (VI). However, curium (III) fails to oxidize on radiation. Oxidation of curium (III) with sodium perxenate in cold sulfuric acid was also unsuccessful. References 8: 4 Russian, 4 Western.

**Prediction of Properties and Method of Preparation of Curium (VII)**

937M0174C St. Petersburg RADIOKHIMIYA  
in Russian Vol 35 No 3 May-Jun 93 (manuscript received 10 Dec 92) p 7

[Article by V. P. Shilov; UDC 546.799.6]

[Abstract] Comparison of thermodynamic and optical properties and stability in aqueous alkaline solutions of heptavalent neptunium, plutonium, and americium, makes it possible to predict certain properties of curium (VII). The oxidation potential of a metal pair  $M(VII)/M(VI)$  in 1 mole per liter  $NaOH$  increases almost linearly in the series  $Np-Pu-Am$ . Extrapolation shows that the  $Cm(VII)/Cm(VI)$  potential is 1.3 volts. This value indicates that curium (VII) could at some time exist in an alkaline solution. In the present work it is postulated that on the basis of published data, preparation of curium (VII) in cold alkaline solutions is possible by reaction of strong oxidizers with curium (VI). Possible oxidizers include ozone, the  $O_2^-$  ion-radical, and any compound having an oxidation potential of 1.3 volts in this medium.

**Preparation of Neptunium (IV) Sols From Neptunium Oxalate**

937M0174E St. Petersburg RADIOKHIMIYA  
in Russian Vol 35 No 3 May-Jun 93 (manuscript received 30 Jun 92) pp 8-11

[Article by A. I. Logvis and N. N. Krot; UDC 546.7993]

[Abstract] Neptunium sols are important for the preparation of neptunium dioxide microspheres, although information on  $Np(IV)$  sol preparation in the published literature is sparse. It has been demonstrated that heating a solution of neptunium (IV) hydroxide in excess nitric acid results in 70 percent conversion of neptunium to the colloidal state, depending on the temperature and

acidity. Also, preparation of uranium (IV) sols by oxidation-peptization has been well established, and therefore it is reasonable to assume that neptunium (IV) sols may be prepared by an analogous method. In the present work neptunium (IV) hydroxide was prepared by treating neptunium (IV) oxalate with ammonia. The

hydroxide had minimum oxalate ion content and Np (V) impurity. It was then peptized with hydrochloric, nitric, and acetic acids to yield Np (IV) sols in 2-2.5 mole/liter concentrations and not over 4 percent Np (V) content. Absorption spectra are presented. Figure 1; references 6: 2 Russian, 4 Western.

## ANALYSIS, TREATMENT, MINING

## Low-Temperature Transformation and Magnetic Properties of Fe-B-Si Amorphous Strip

937D0146A Yekaterinburg FIZIKA METALLOV I METALLOVEDENIYE in Russian Vol 75 No 2 Feb 93 (manuscript received 23 Jun 92) pp 44-49

[Article by G.N. Konygin, Ye.P. Yelsukov, V.A. Makarov, V.I. Ladyanov, and G.A. Sirotinina, Physical Technical Institute, Ural Department, Russian Academy of Sciences, Izhevsk, and Udmurt State University, Izhevsk; UDC 669.15'781'782:537.622]

[Abstract] A study examined the effect of annealing temperature and structural state on the formation of the magnetic properties (permeability and coercitive force) of amorphous alloys. An amorphous strip of  $Fe_{80}B_{10}Si_{10}$  measuring 20  $\mu m$  in thickness and 10 mm in width was used for the studies. The alloy was obtained by enriching iron with 2 atomic percent of the stable isotope  $^{57}Fe$  to make it possible to obtain quality Mossbauer conversion electron spectra in a relatively short amount of time. The alloy strip was studied in its initial state and after cycles of isochronous annealing in a vacuum of about 10 $^{-3}$  Pa for 1 hour at temperatures of 50 to 800°C. The specimens were also studied by x-ray diffraction, Mossbauer absorption spectroscopy, and sliding-beam x-ray diffraction. X-ray crystallographic analysis of the  $Fe_{80}B_{10}Si_{10}$  demonstrated that in its starting state, it is amorphous. The first signs of its crystallization, manifested in terms of the appearance of a weak intensity against the background of the "halo" that is characteristic of amorphous materials, were observed after annealing at temperatures of 295-315°C. As the annealing temperature was increased, the percentage of crystalline phase increased. The study  $Fe_{80}B_{10}Si_{10}$  was found to undergo four stages of structural development. No structural changes were evident at 0-300°C. At 300-400°C, a body-centered crystal lattice with the characteristic close atomic order similar to that in the amorphous matrix developed; this process was accompanied by an explicit change in orientation of magnetic moments. At temperatures of 400-500°C, the percentage of body-centered crystal lattice increased until the amorphous matrix completely disappeared (after the specimen had been held for 1 hour at 455°C), and processes of close demixing began. At 500-800°C, a transition to an equilibrium phase diagram occurred. In its equilibrium state, the specimen consisted of two phases: a body-centered crystal lattice and  $Fe_2B$ . The Mossbauer spectroscopy studies pinpointed the temperature of onset of crystallization at around 250°C and indicated that the crystal regions lie at a depth of about 15 nm. The first of the above stages (i.e., 0 to 300°C) included three stages of structural relaxation. They were identified by changes in the specimen's magnetic characteristics at 75, 175, and 255°C. No structural changes were evident in the first two stages. In third stage, which is the most favorable from the standpoint of optimizing the magnetic properties of amorphous strips and increasing the stability of its properties over time, was accompanied by the appearance of nanocrystal regions in

the near-surface layer of the amorphous strip's contact side. Figures 7; references 10: 7 Russian, 3 Western.

## Features of Microstructure and Magnetic Properties of High-Coercivity Microstrips of Alloys Based on Fe-Cr-Ni

937D0146B Yekaterinburg FIZIKA METALLOV I METALLOVEDENIYE in Russian Vol 75 No 2 Feb 93 (manuscript received 21 Apr 92; after revision 30 Sep 92) pp 69-75

[Article by A.R. Baraz, F.I. Stetsenko, A.M. Glezer, I.A. Komarova, and Yu.Ye. Chicherin, Central Ferrous Metallurgy Scientific Research Institute imeni I.P. Bardin; UDC 669.24'26:537.622]

[Abstract] A study examined the morphology, dimensions, and orientation of particles of the ferromagnetic phase in 7.5- to 15- $\mu m$ -thick microstrips of the cold-deformed stainless steel alloys 0Kh12N12M3 and 0Kh12N12K3. The study specimens, which had been deformed by rolling to a degree of 98 percent with intervening cycles of tempering, were examined under light and transmission electron microscopes. The structural studies were performed on specimen strips with a thickness of 10  $\mu m$ . The alloy 0Kh12N12M3 was determined to have a coercitive force of 29.5 kA/m, a saturation induction of 0.13, and a residual magnetization of 0.09. The alloy 0Kh12N12K3 was determined to have a coercitive force of 62.9 kA/m, a saturation induction of 0.15, and a residual magnetization of 0.13. The particles of the specimens'  $\alpha$ -phase were found to have very diverse shapes and sized and to contain the following characteristic types of particles/regions: 1) isolated small equiaxial or anisotropically shaped  $\alpha$ -phase particles with a cross section of 4 to 10 nm and an axis ( $l/d$ ) ratio of <3:1; 2) highly fragmented (i.e., in a block structure) particles of rather diverse shape with cross sections of 10 to 165 nm; and 3) colonies of elongated uniaxial particles with cross sections of 4 to 20 nm and an axis ratio between 3:1 and 12:1 (the direction of their long axes was generally close to the direction of rolling, and the particles often appeared to consist of individual fragments or chains of smaller particles within the confines of the defect band); and 4) regions with a relatively low density of  $\alpha$ -phase measuring 0.5-3  $\mu m$ . The studies indicated that the main contributor to the study alloys' level of magnetic properties are anisotropic particles with a heterogeneous structure consisting of disoriented fragments (blocks) and/or individual microparticles separated by  $\gamma$ -phase interlayers. Figures 4, table 1; references 17: 7 Russian, 10 Western.

## COMPOSITE MATERIALS

Distribution of Titanium in the Structure of Various Components of Superconducting Composites Based on  $Nb_3Sn$ 

937D0146C Yekaterinburg FIZIKA METALLOV I METALLOVEDENIYE in Russian Vol 75 No 2 Feb 93 (manuscript received 15 Jul 92) pp 112-118

[Article by Ye.N. Popova, L.A. Rodionova, S.V. Sudareva, A.Ye. Vorobyeva, Ye.A. Dergunova, A.M. Chukin, A.K.

Shikov, A.D. Nikulin, and Ye.P. Romanov, Metal Physics Institute, Ural Department, Russian Academy of Sciences, and All-Union Scientific Research Institute of Inorganic Materials imeni A.A. Bochvar, Moscow; UDC (621.763+539.945):620.186.1]

[Abstract] A study examined the distribution and effect of titanium in the structure of the various components of the composite Nb/Cu-Sn when it is used as an alloy-forming element in the amount of 0.2 percent by weight. The studies were performed on free bronze consisting of copper plus 13 weight percent tin and 0.2 weight percent titanium after homogenization at 700°C for 20 hours and on multi-filament composites consisting of Nb/Cu plus 13 weight percent Sn and 0.2 weight percent titanium (each composite contained 7,225 1-mm-diameter filaments) after diffusion annealing at 700°C for 72 hours. The fine structure of the composites and bronze were studied under a JEM-200 CX electron microscope, and the distribution of their elements was studied on a JCXA-733 scanning microscope/microanalyzer. The studies established that during the annealing process, the titanium diffuses from the bronze matrix through the Nb<sub>3</sub>Sn layer into the niobium filaments. During the course of this process, the growth rate of the diffusion layer increased along with its thickness, and the anisotropy of the grains' shape decreased. No reduction in grain size was observed, however. The thermodynamics and kinetics of this redistribution of titanium in the composite were explained in terms of previously published mathematical studies of the partial free energy of titanium in solid solutions, the change in free energy during the face-centered crystal lattice → body-centered crystal lattice transition, and the condition of local equilibrium on the interface between solid solutions. The mechanism of the diffusion of titanium from the bronze into the filaments was shown to be more complicated but was also explained. Figures 7; references 14: 5 Russian, 9 Western.

#### Effect of Gallium Alloying on the Structure and Properties of Superconducting Composite With Nb<sub>2</sub>Sn

937D0146D Yekaterinburg FIZIKA METALLOV I METALLOVEDENIYE in Russian Vol 75 No 2 Feb 93 (manuscript received 15 Jul 92) pp 119-124

[Article by Ye.N. Popova, L.A. Rodionova, S.V. Sudareva, N.V. Nikolayeva, A.K. Shikov, A.Ye. Vorobyeva, Ye.A. Dergunova, and A.M. Chukin, Metal Physics Institute, Ural Department, Russian Academy of Sciences, and All-Union Scientific Research Institute of Inorganic Materials imeni A.A. Bochvar; UDC (621.763+539.945):620.186.1]

[Abstract] A study examined the effect that alloying the bronze matrix of an Nb/Cu-Sn composite with gallium in the amount of 2 percent by weight has on the alloy's various components before and after diffusion annealing. The studies were performed on free bronze consisting of copper plus 11 weight percent tin and 2 weight percent gallium after homogenization at 700°C for 20 hours, as well as on a single filament of Nb/Cu plus 11 weight

percent tin and 2 weight percent gallium after hot compaction and on a composite consisting of 7,225 filaments of the same composite that had been subjected to diffusion annealing at 700°C for 72 hours. The study specimens were examined under a JEM-200 CX transmission electron microscope and JCXA-733 scanning electron microscope/microanalyzer. The addition of gallium to the study composites was demonstrated to cause an increase in the number of twins and ε-phase formations in the bronze matrix due to a decrease in packing defect formation energy. During the course of diffusion annealing, the gallium diffused into the Nb<sub>3</sub>Sn layer and was partially preserved in the bronze matrix. Gallium was also found to increase the grain size in the superconducting layer and to not facilitate any increase in its thickness. The dissolution of gallium in Nb<sub>3</sub>Sn in large quantity during the course of diffusion annealing was found to result in an increase in the electrical resistance of the said phase in its normal state and, consequently, in an elevation of the upper critical field. This result is in turn associated with the higher current-conducting capability of gallium-alloyed conductors in high magnetic fields versus that of their nonalloyed counterparts. Figures 8; references 10: 4 Russian, 6 Western.

#### METALS

##### Effect of Low-Temperature Annealing on the Structure and Superconducting Properties of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-8</sub> Compounds With Different Nonstoichiometry With Respect to Oxygen

937D0146E Yekaterinburg FIZIKA METALLOV I METALLOVEDENIYE in Russian Vol 75 No 2 Feb 93 (manuscript received 28 May 92; after revision 24 Aug 92) pp 125-131

[Article by S.V. Sudareva, Ye.I. Kuznetsova, T.P. Krinitsina, I.B. Bobylev, V.N. Morycheva, L.V. Zherdeva, and Ye.P. Romanov, Metal Physics Institute, Ural Department, Russian Academy of Sciences; UDC (546.562+538.945):621.785.375]

[Abstract] A study examined the effect of low-temperature annealing at 200°C for 100 hours on the structure and superconducting properties of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-8</sub>. Two series of single crystals measuring 1 × 2 × 0.1 mm with stoichiometric and nonstoichiometric compositions were prepared. The first were grown by the method of dissolution in a melt, with a close-to-eutectic mixture of BaO and CuO serving as the solvent. The melting and crystallization were performed in Y<sub>2</sub>O<sub>3</sub>-stabilized zirconium dioxide crucibles. The starting mixture consisted of 44.8 percent BaO, 53.5 percent CuO, and 1.7 percent Y<sub>2</sub>O<sub>3</sub>. Before the crystallization, the melt was held at 1,030°C for 4 hours, cooled at a rate of 1°/h from 1,000°C to 880°C, and then further cooled to room temperature at a rate of 100°/h. The single crystals in the second series were subjected to additional oxidative annealing in an oxygen atmosphere at 400-650°C for 26 hours to achieve oxygen stoichiometry. The specimens were studied on a DRON-3M automated system. The low-temperature annealing was conducted at 200°C

for 35 and 100 hours. In complete consistency with Khachaturyan's theory, the structure of the single crystals with a stoichiometric composition (i.e.,  $\text{YBa}_2\text{Cu}_3\text{O}_7$ ) turned out to be stable and did not undergo any noticeable changes as a result of the low-temperature annealing at 200°C for 100 hours. Their coarse twin structure was completely maintained, their diamagnetic response curve remained virtually unchanged, and their high temperature of transition to a superconducting state prior to annealing remained the

same. The single crystals with a nonstoichiometric composition, on the other hand, underwent significant changes after low-temperature annealing for 200 hours. Their coarse twins were replaced by a finely disperse tweed structure, and many differences between their electron-diffraction patterns recorded before and after annealing were evident. Their striation after annealing was attributed to waves of atomic displacements. Figures 7; references 7: 1 Russian, 6 Western.

### Construction of a Switching Network in Database Machines

947G0005B Kiev ELEKTRONNOYE  
MODELIROVANIYE in Russian No 4 Jul 93-Aug 93  
(manuscript received 11 Mar 92) pp 90-91

[Article by V. F. Guzik, S. A. Chinenov, Taganrog Radio-technical Institute, Russia; UDC 661.325]

[Abstract] Traditional computer architectures are inadequate to solve some problems in real time and simple parallel computing is inadequate for database operations, especially when the database is large. A complete topology between processors is needed for efficient processing in real time. The ability to reconfigure memory and processors decreases the total number of iterations required to process large data files. This article examines the possibility of using a hypercube switching network to reconfigure processor elements and memory in database machines. Two hypercubes are united to form a four-dimensional hypercube. Any processor can be linked with any memory unit, and any memory unit can be linked with any other memory unit. The hypercube can be used to perform randomization, sorting, and other relational algebra operations. Figures 4; references 4: 3 Russian, 1 Western.

### Use of Walsh-Pally Transforms To Numerically Solve Helmholtz Equation

947G0003A Kiev ELEKTRONNOYE  
MODELIROVANIYE in Russian No 4 Jul 93-Aug 93  
(manuscript received 24 Feb 92) pp 13-16

[Article by A. D. Kozhukhovskiy, A. I. Litvin, Cherkassy Engineering-Technology University, Ukraine; UDC 681.5:512.643.8]

[Abstract] This article examines means of solving the Dirichlet problem for the Helmholtz equation in singly-connected nearly rectangular regions using Walsh-Pally transforms. The use of fast Walsh transforms increases the solution speed (by a factor of 1.5-2 over the fast Fourier transform) and reduces the amount of computer memory needed. It is found that solving the two-dimensional Helmholtz equation may be reduced to solving the one-dimensional problem. Figures 2; references 12: 11 Russian, 1 Western.

### Organization of a Parallel Computer of Trigonometric Equations in the Area of T-Transforms

947G0003B Kiev ELEKTRONNOYE  
MODELIROVANIYE in Russian No 4 Jul 93-Aug 93  
(manuscript received 19 June 92) pp 37-39

[Article by V. A. Ryndyuk, Institute of Modeling Problems in Power Engineering, Academy of Sciences of Ukraine, Kiev; UDC 68.103]

[Abstract] Systems of differential equations are commonly used to mathematically model objects. Nonlinear systems

can be described using the theory of differential Taylor transforms. Models based on these transforms can be solved quickly. The simplicity of representing Taylor models and organization of the computing process is the basis for the synthesis of functional transform structures. Here the mathematical model is converted into a spectral model by replacing functions and actions on functions with T-spectra and operations on functions with operations on differential spectra. The spectral model is a system of recurrent equations. The desired functions are found in the form of segments of Taylor power series. Linear and nonlinear systems of equations can be studied with Taylor notation. The example of finding the T-spectrum of trigonometric and hyperbolic functions is presented. The parallel computing structure synthesized here can reproduce T-models of trigonometric functions in real time. The advantages of a parallel specialized computer over a personal computer are shown, specifically, the scheme presented in this article is a factor of 80 faster than a YeS-1840 personal computer. References 2 (Russian).

### Navigation Method Using a Field of Reference Points

937G0087 Moscow TEKHNICHESKAYA  
KIBERNETIKA in Russian No 4 Apr 93 (manuscript received 9 Sep 92) pp 148-156

[Article by A. P. Kirsanov, A. V. Solov'yev; UDC 629.7.05:519.2]

[Abstract] This article presents an aircraft navigation method using reference points. The method makes it possible to reduce the volume of cartographic information stored in on-board memory. The method is based on analysis and comparison of the mutual positions and distances between reference points in a fragment of the field observed by sensors and a reference map. This approach is similar to a person finding his location by identifying known constellations whose position in the sky depends on time and the location of the observer. The set of observed reference points and the map are described by special graphs, and the comparison procedure is formalized as finding the maximally isomorphic subgraphs. Results of mathematical modeling are described and the accuracy of the method is evaluated. Figures 6; references 6 (Russian).

### Implementation of Theoretical-Numerical Transforms in Codes Generated by Redundant Computing Systems

947G0004 Kiev ELEKTRONNOYE  
MODELIROVANIYE in Russian No 4 Jul 93-Aug 93  
(manuscript received 9 Mar 92) pp 33-37

[Article by V. M. Chernov, Samar State Aerospace University, Russia; UDC 681.325.5]

[Abstract] This article examines discrete orthogonal transforms in Galua fields implemented without multiplications. Algorithms in which multiplication is replaced by register shifts are found to be more efficient. Discrete orthogonal transforms are examined in finite fields with

representation of the input in nontraditional notation systems (e.g., systems with an irrational base, Fibonacci codes, "golden" proportions, and their generalizations) whose basis is generated by a linear recurrent sequence. Table 1; references 3: 2 Russian, 1 Western.

**Analysis of the Absolute Stability of Multidimensional Nonlinear Pulsed Automatic Systems Based on Algebraic Modification of Criteria Obtained with a Bilinear Transform**

937G0088 Moscow TEKHNICHESKAYA KIBERNETIKA in Russian No 4 Apr 93 (manuscript received 14 Aug 92) pp 21-28

[Article by V. I. Serkov, N. A. Tseligorov, Rostov on Don; UDC 62-503.4]

[Abstract] The criteria of multidimensional nonlinear pulsed automatic systems are obtained on the basis of  $w$  transforms which require a positive determination of the Hermitian conjugate matrix. These criteria are modified so that analysis of the absolute stability of the system is reduced to computer verification of the strict continuation of the real polynomial. Figure 1; references 18: 15 Russian, 3 Western.

**Parallel Architecture in Computer Systems**

947K0011A Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3 May 93-Jun 93 pp 37-51

[Article by O. N. Bulavenko; UDC 681.3.06]

[Abstract] State-of-the-art in the development of computer systems with massively-parallel architecture is reviewed. Computers with a SIMD (single-instruction, multiple-data) and MIMD (multiple-instruction, multiple-data) architecture are briefly discussed. This category of architecture is subdivided in a large number of sub-groups including: systolic massive architecture, linear massive architecture, a matrix forming processor massive, etc. The particular features of some representative architectures and structures of high level parallel processing with simple and complex processor elements are examined. Along with various foreign made computers of average capacity with complex processor elements, functioning of the "Intelligent Computer 1" (IK-1) is described. This is a parallel multiprocessor system, for general application, developed in the Ukrainian AS Cybernetic Institute. Bit-sequential processing and role of Hypercube, Theta-Network, and Universal Readjustable type communication networks are also discussed. Figures 3, references 50: 3 Russian, 47 Western

**Solid-Phase Decomposition of GaAs Under the Impact of Laser Radiation of Threshold Density**

937K0277A St Petersburg FIZIKA I TECHNIKA  
POLUPROVODNIKOV in Russian Vol 27 No 4  
Apr 93 pp 583-587

[Article by A. G. Dmitriev, St. Petersburg State Technical University, St. Petersburg, Russia]

[Abstract] The surface temperature of gallium arsenide crystals was determined when they were irradiated by laser pulses of a threshold density. Changes of the polished surface morphology occur at this temperature. This temperature turned out to be about 900 K, which is significantly below the GaAs melting temperature. Methods, based on studying relaxation of the irradiated crystal transient conductivity were employed for the temperature measurements. This involved applying the fact that the transition temperature from impurity conductivity to intrinsic conductivity can be taken as a reference temperature, and the condition that when the temperature is exceeded during irradiation, it is accompanied by appearance of a long lasting component on the relaxation curve of the transient conductivity. Using a set of crystals with a different concentration it was possible to determine the temperature on the surface at a particular irradiation density. Figures 2, references 6: 4 Russian, 2 Western.

**Layer-by-Layer Study of Ion-Implanted Silicon by Ellipsometry and Selective Moistening Methods**

937K0277B St Petersburg FIZIKA I TECHNIKA  
POLUPROVODNIKOV in Russian Vol 27 No 4  
Apr 93 pp 588-593

[Article by L. F. Bakhturova, V. V. Bakovets, I. P. Dolgovesova, B. M. Ayupov, S.B. RAS Institute of Inorganic Chemistry, Novosibirsk, Russia]

[Abstract] Silicon samples, implanted by  $^{40}\text{Ar}^+$  ( $10^{15}\text{cm}^{-2}$  dose) ions and  $\text{P}^+$  ( $10^{16}\text{cm}^{-2}$  dose) ions with 40 keV energy, were examined employing the methods of multiangular ellipsometry and selective moistening with a layer-by-layer removal of the implanted section using anode oxidation. With implantation by  $\text{Ar}^+$  ions, the maxima of the experimentally obtained profiles  $\theta$ ,  $n$  and  $k$  lie nearer to the surface, than with implantation by ions  $\text{Ar}^+$ . This can be explained by the fact that the mass of  $\text{Ar}^+$  ions is greater, and the implantation dose is slightly smaller than for  $\text{P}^+$ . With implantation by  $\text{Ar}^+$ , as well as by  $\text{P}^+$  ions, the profiles  $\theta$  and  $k$  are identical, and correspond to the defects' distribution profile in the implanted layer. The profile of the  $n$  changes is, probably, determined by a joint action of the defects and impurity. Figures 3, references 20: 16 Russian, 4 Western.

**Electron Minibands in  $(\text{GaAs})_N(\text{AlAs})_M$  Superlattice With Even or Odd  $M$**

937K0277C St Petersburg FIZIKA I TECHNIKA  
POLUPROVODNIKOV in Russian Vol 27 No 4  
Apr 93 pp 594-599

[Article by I. L. Aleyner, Ye. L. Ivchenko, RAS Technical Institute of Physics, St. Petersburg, Russia]

[Abstract] Numerical computations of electron minibands in the  $(\text{GaAs})_N(\text{AlAs})_M$  superlattice conducted previously by pseudo-potential or strong coupling methods demonstrated that the mixing character between electron states  $G$  and  $X$ , is significantly different for even or odd  $M$ . In studies by other authors cited here, the miniband structure of the GaAs/AlAs superlattice was computed within the framework of the effective mass method applying some boundary conditions for the electron wave function, and contrary to the empirical results, the even or odd property of the  $M$  monolayer was not affecting the miniband spectrum. It is demonstrated in this study that these boundary conditions require a revision. After introducing a sign changing multiplier, depending on the number of the superlattice monolayer, the computations in approximation of the effective mass also indicate a dependence of the  $GX$ -mixing effect on the even-odd property of the  $M$  number. Electron dispersion for two lower miniband is found in the superlattice transition region from type I to type II. Figure 1, references 9: 2 Russian, 7 Western.

**The Electroluminescence of Epitaxial GaP p-n Structures, Grown on Si-Substrates**

937K0277D St Petersburg FIZIKA I TECHNIKA  
POLUPROVODNIKOV in Russian Vol 27 No 4  
Apr 93 pp 668-673

[Article by V. V. Yevstropov, Yu. V. Zhilyayev, N. Nazarov, D. V. Sergeyev, L. M. Fedorov, RAS Technical Institute of Physics, St. Petersburg, Russia]

[Abstract] Epitaxial phosphide-gallium p-n-structures on a Si-substrate were obtained by the method of gas-phase epitaxy in an open chloride system. Their electrical and electroluminescent characteristics were examined. The current-voltage characteristic at small values of current ( $6 \times 10^{-8}$  -  $6 \times 10^{-4}$  A/cm $^2$ ) exhibits a tunnelling behavior. At direct currents, it is exponential (with a pre-exponential multiplier  $10^{-8}$  A/cm $^2$  and a 75 meV characteristic energy); at reverse currents, it is to a power 4). The voltage cut-off is about 1.85 V, the breakdown voltage is 12-18 V and the differential resistance is 4.5 Ohm. The capacitance-voltage characteristic is to the second power with a cut-off voltage of 1.8 V, the slope  $1.75 \times 10^{-4}$  nF $^{-2}$ /V $\text{cm}^{-4}$ . With a reverse bias, the obtained structures emit a visible light. The electroluminescence spectrum is wide, decreasing to the side of large energies of photons in the 1.6 - 2.5 eV range; the quantum output of the electroluminescence comprises  $10^{-3}\%$ , and does not depend on current. The totality of experimentally obtained data agrees with the concept of avalanche breakdown (with a reverse bias above 12-18 V), due to shock ionization, which generates the light radiation. Figures 4, references 10: 5 Russian, 5 Western.

**An Effectiveness Criterion for a Method of Echo-Suppression and a Hybrid Echo-Suppressor Configuration**

937K0274A Moscow ELEKTROSVYAZ in Russian  
No 3 Mar 93 (manuscript submitted 26 May 92) pp 21-24

[Part I of two-part article by S. V. Kunegin under the rubric "Switching, Telephony"; UDC 621.391.664.12]

[Abstract] A new approach to the elimination of interfering echo signals in long-distance telephone channels is presented based on a combination of traditionally separate echo-suppression techniques. The use of both echo rejection and echo compensation models within the same equipment is desireable to take advantage of the relative technical simplicity of the former and the superior signal-handling capabilities of the latter. Optimization of the internal characteristics, i. e., suppression methods, of echo suppressors has application to dynamic, stochastic, discrete and both controlled and uncontrolled systems. The effectiveness criterion for the suppression method is composed of three subindicators: technical difficulty of echo-suppression (in terms of complexity of computation); signal quality (expressed in user rating units); functional reliability (determined by the expanse of the functional conditions). Echo rejection and compensation methods are evaluated by the use of computerized simulation or modeling. Algorithms are worked out for input, output and primary control signals using a recognition device, threshold limiting device and a delay line. Block diagrams detail signal processing stages in the echo-rejection model, the echo-compensation model and the echo-path simulation model. Use of a summing circuit in the latter allows an analysis of the effect of various types of additive interference for modeling of echo-suppressor breakdown conditions. Modeling of external additive noise effects is achieved by means of generators employing smoothed noise distribution, Gaussian noise distribution, harmonic interference and pulsed interference. Results of the evaluation of all methods, including the combined method of echo suppression, are to be examined in the second part of the article. Figures 3; references 13: 12 Russian.

**Determination of Allowable Distances From Communications Cables in Blasting Operations**

937K0274B Moscow ELEKTROSVYAZ in Russian  
No 3 Mar 93 (manuscript submitted 24 Jan 91) pp 25-28

[Article by A. V. Kolchenko, S. M. Rak and N. P. Chechenev under the rubric "Communications Lines"; UDC 621.315.2]

[Abstract] Analysis of the effects of powerful explosions on ground areas containing buried communications cables reveals that, in many cases, established limits on such blasting operations may be relaxed without significantly affecting the mainline cable integrity under dynamic load.

Allowable distances from the location of the blasting charge, as determined by individual cable characteristics, may even be within the throw zone of the blast. Employing an analogy to underground pipes, the cable is viewed as a structural member resting on a cushion, its momentary deformation independent of the orientation of the blasting charge relative to its location. Moreover, movement of the cable and ground are synchronous and conform to the hypocentric distance from the blast. Formulas for determining the necessary strength of underground cable are arrived at based on computations of the coefficient of seismic intensity, and bending moment and radius of curvature of the cable structure. Final values for allowable distance are determined to be the greater of all values obtained by computation and comparative analysis. Charts specifying inherent characteristics for dozens of different cable designations are provided for selection of the proper cable diameter, rigidity, load-bearing strength, jacket thickness, etc. for use in or near areas of seismic disturbance. The authors offer their findings as a basis for new departmental standards for cable requirements. Figures 3; tables 2; references: 6 Russian.

**Application Efficiency of a Two-Beam Filter with Reception of Television Frequency Modulated Signal**

947K0013A Moscow ELEKTROSVYAZ in Russian  
No 6 Jun 93 pp 30-33

[E. Ya. Ryskin, G. M. Kholodilin, D. V. Tsirlin, Yu. D. Shavdiya; UDC 621.396.621.33]

[Abstract] Application of a standard demodulator with a two-beam filter (TBF) at the input, synthesized by a delay line, is examined in this article. Devices with a negative frequency feedback (NFFB) are normally employed as noise immune demodulators of frequency modulated (FM) signals. The examined device is just as effective as the NFFB, but its construction is much simpler. With a particular selection of delay, the noise band of this filter can reduce the noise band at the demodulator input by a factor of two. The phase characteristic of the filter between the AFC zeros is linear. With application of linear pre-distortions, changes introduced by the TBF into differential gain and phase keep them within a norm. A block diagram of the device, is provided and its functioning is discussed. Computations of differential phase and differential gain produced by using the TBF were performed with the assumption that a linear pre-distortion filter of TV signals was used at the transmitter side. Noise immunity of FM TV signals with a TBF at the input was computed and numerical modeling was carried out. Efficiency of employing non-linear pre-distortions is also examined. Theoretical and experimental studies demonstrate that application of the TBF with reception of FM TV signals and employment of non-linear pre-distortions is effective. Figures 7, references: 11 Russian

## AVIATION AND SPACE TECHNOLOGY

### Instrument for Measuring Atmospheric Refraction From Space

947F0027A St. Petersburg *IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RIBOROSTROYENIYE* in Russian Vol 36 No 3 May-Jun 93 pp 56-61

[Article by A.A. Buznikov, M.A. Kovalev, St. Petersburg State Electrical Engineering University imeni V.I. Lenin (Ulyanov); UDC 551.508.551.524]

[Abstract] The suitability of atmospheric refraction measurements from satellites (ISZ) in order to obtain periodic data on the weather parameters of the atmosphere and plot their vertical profiles and the efficiency of remote refractometric probing as well as the expediency of developing an instrument for measuring atmospheric refraction prompted the development of an instrument which combines the functions of gas analyzer and refractometer whereby refraction is measured on the basis of the apparent vertical dimension of the sun disc. Block diagrams of two design versions and the optical train of the refractometer, a block diagram of the signal processing system, and a video signal diagram for one line are cited. Both designs are based on filming the sunset and sunrise from Salyut orbiters through the earth's atmosphere at a small angle between the direction toward the sun and the satellite orbit plane whereby the transmitted ray perigees dissect the atmosphere almost vertically with a small horizontal displacement on the scale of weather variations in the weather fields. A vidicon or a dissector can be used as the photodetector. Figures 3; references 6.

## NUCLEAR AND NON-NUCLEAR ENERGY

### Commissioning of CIS's First Small Hydroelectric Power Plant With Pumps and Motors Serving as Turbines and Generators

947F0028A Moscow *GIDROTEKHNICHESKOYE STROITELSTVO* in Russian No 9 Sep 93 pp 11-13

[Article by V.V. Berlin, O.A. Muravyev; UDC 621.311.21.004.69]

[Abstract] Commissioning of the small Dobromyslyanskaya hydroelectric power plant on the Chernitsa River in Belarus after retrofitting and an overhaul is reported. Initially, the plant was equipped with two hydroelectric units with RO123-V-84 turbines; the new power station employs commercially produced pump units serving as turbines and induction motors running as generators. This design has advantages both from the cost and delivery schedule viewpoints. Data on the power plant equipment option costs in 1990 prices are summarized. The range of factors which must be taken into account is selecting the

pump is outlined. Analyses show that pump impellers have a 75% efficiency within a broad head range, which is lower than that of turbines, but this is compensated for by the low cost of equipment which is cheaper by close to tenfold. The particular features of induction motors make them especially suitable at small power plants with a low head. The power plant overhaul was financed by the Vitebsk electric grids under the leadership of G.I. Kubarovskiy; plant construction and erection were conducted by the Gidrotehnika Association (Lithuania) and Belyy Ugol enterprise under the direction of N.V. Shanin. Figures 1; tables 1; references 2.

### Certain Issues of Developing Electromagnetic System of Tokamak-Type Fusion Reactor

947F0045A Moscow *IZVESTIYA ROSSIYSKOY AKADEMII NAUK: ENERGETIKA* in Russian No 5 Sep-Oct 93 pp 81-88

[Article by V.A. Glukhikh, St. Petersburg; UDC 621.039.6.02]

[Abstract] The design and operating principles of Tokamak fusion reactors, their principal parameters, and recent advances in controlled nuclear fusion (UTC) research are outlined, and the performance indicators of T-15, TFTR (US), JT-60 (Japan), JET (Euratom), and ITER (joint development by Euratom member-countries together with the United States, Russia, and Japan) are compared. The specific requirements imposed upon the reactor's electromagnetic system—the most complicated and expensive component reaching more than 20% of the entire structure's price tag—and the three key problems which must be solved in developing the electromagnetic system, i.e., developing a superconducting cable, electric insulation, and structural cryogenic materials, are discussed in detail. The three principal stages of the research program aimed at solving these problems—examining short samples and determining the current carrying ability in magnetic fields of up to 12 T or more, developing production practices for making 500 m long conductors and examining model coils made from this conductor, and examining model toroidal and poloidal field coils under the conditions which simulate actual windings operation—are presented. A schematic diagram of the ITER fusion reactor and conductor and test bench design drawings are cited. Two winding and conductor fabrication methods developed by the Inorganic Materials Institute imeni A.A. Bochvar are summarized, and the outcome of the early R&D efforts is analyzed. Two brands of steel have been selected for the electromagnetic system: 03Kh20N16AG6 and 03Kh13N9G19AM2. The conclusion is drawn that the findings obtained thus far attest to the possibility of developing an electromagnetic system for an ITER reactor with a 22 MA plasma current and a fusion power on the order of 1 GW. Large-scale research at the second and third stage must address the scientific and engineering issues related to developing these unique structures. Figures 4; tables 4; references 2: 1 Russian, 1 Western.

## INDUSTRIAL ENGINEERING

Determining Stresses in Machine Rotors in  
Three-Dimensional Models

947F0032A Moscow *VESTNIK*  
*MASHINOSTROYENIYA* in Russian  
No 9 Sep 93 pp 9-12

[Article by A.D. Kondratyev and B.N. Ushakov, doctor of technical sciences, State Scientific Research Institute of Machine Building imeni A.A. Blagonravov, Russian Academy of Sciences; UDC 62-13:531.781.2]

[Abstract] The most detailed and exact information regarding the distribution and concentration of stresses in machine rotors is obtained by using three-dimensional "frozen" models. A model is made of optically active epoxy materials heated in a thermostatted chamber until they become highly elastic and then set into rotation. During the rotation process, the model cools slowly to room temperature. After the model has cooled, the deformations and optical anisotropy induced in it by centrifugal

forces are fixed (in other words "frozen"). The model is cut into thin plates (sections) that are in turn illuminated with polarized light in a polariscope. The stresses and strains in the sections are then determined on the basis of the patterns of the interference bands. The stresses and strains measured in the model are then recalculated for a full-scale structure based on dimensionality and similarity methods. The use of three-dimensional models has several advantages: They are easily machined and glued, and they make it possible to measure stresses in internal areas of rotors that cannot be measured by stress gauges or brittle coatings. In cases of stresses induced by a combination of centrifugal forces and the pressure of liquid on the rotor's wall, the model is filled with glycerin or silicon, and the calculations are based on two sets of measurements—one when the model is filled with liquid and one when the model is empty. A series of formulas for measuring the stresses and strains on and in rotors is presented, and use of the proposed method and formulas is illustrated by way of the example of a model of the impeller of a high-speed pump. Figures 5; references 5: Russian.

**Decrease in Atmospheric Transparency in Polar Regions (Effect of Eruptions of Mt. Pinatubo and Mt. Hudson)**

947N0002A Moscow *IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA* in Russian  
Vol 29 No 4 Jul-Aug 93 pp 570-571

[Article by V. F. Radionov, M. S. Marshunova, Arctic and Antarctic Scientific Research Institute; UDC 551.590.3]

[Abstract] Two global decreases in the total transparency of the atmosphere have been observed in long-term measurements of the total fluxes of direct solar radiation in the Arctic and Antarctic. These were associated with the eruptions of Agung in March 1963 and El Chichon in April 1982. Direct measurements of the spectral aerosol optical depth of the atmosphere at both poles showed that a new decrease in total transparency since 1982-3 is associated with an increase in aerosol attenuation. Measurements of optical depth using the ABAS solar photometer were used to pinpoint the effect of the eruptions of Mt. Pinatubo (Philippines) and Mt. Hudson (Chile). It was found that the aerosol optical depth of the atmosphere in 1992 was a factor of 2-3 larger than the average value and was comparable with the value observed in the Arctic after the El Chichon eruption. Tables present atmospheric transparency values and aerosol optical depth figures for this time period (and other periods, for comparison). Figures 2; tables 2; references 6: 4 Russian, 2 Western.

**Evaluation of the Contribution of N-Nitroso Compounds to Atmospheric NO Pollution**

947N0002B Moscow *IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA* in Russian  
Vol 29 No 4 Jul-Aug 93 pp 572-573

[Article by A. A. Kiselev, V. A. Yamshanov, A. I. Voyeykov Main Geophysical Observatory of the N. N. Petrov Scientific Research Institute of Oncology; UDC 551.5 10.4]

[Abstract] One of the authors' previous articles proposed the possible role of HC compounds in the destruction of the ozone layer due to photodissociation of HC with the formation of NO radicals. This article addresses the contribution of HC to the formation of atmospheric NO. Atmospheric HC content is seasonably variable (highest

concentrations occur in summer) and depends on the degree of industrialization of a region. HC is photochemically formed at the surface of bodies of water, and is dissociated by solar radiation, forming NO radicals. It is important to determine the rate of photolysis of HC. A slight dependence of this rate on altitude was found. Data is presented of ground-level measurements of HC over the course of the day. It is found that the contribution of HC to the formation of atmospheric NO is probably small compared to known sources of NO. However, on individual days when HC content reaches extreme levels, HC photolysis may lead to the formation of a significant amount of NO radicals. Consideration of the formation of NO from HC may be important in solving local problems, in particular, in the study of air pollution near reservoirs or industrial areas, key sources of HC. The combustion of organic fuel may be an important source of atmospheric HC. Tables 2; references 6: 4 Russian, 2 Western.

**Radiation Polarization as an Indicator of Distance to a Pulse Source**

947N0003 Moscow *IZVESTIYA AKADEMII NAUK FIZIKA ATMOSFERY I OKEANA* in Russian  
Vol 29 No 4 Jul-Aug 93 pp 574-576

[Article by Yu. V. Puzanov, Ekologiya All-Union Scientific Research Institute Center; UDC 551.521.3]

[Abstract] When one uses the path of a signal to determine the distance between a source and receiver, the classic requirement of object visibility is eliminated. The prime source of information becomes the radiation scattered by the medium between the source and receiver. This article examines one possible method of determining the distance to a pulse source using the time dependence of the degree of polarization of recorded scattered radiation. If the distance is known, this method may be used to obtain information on the microphysical properties of the scattering medium. It is found that the time required to reach the maximum degree of polarization is directly proportional to the distance between the source and receiver. If one knows the scattering angle and the sighting angle one can determine the distance by measuring the maximum polarization time. The factor of pulse length is considered. An alternate method is presented which involves measurements taken at two unequal sighting angles. Figures 3; references 3 (Russian).

## AGRICULTURAL SCIENCE

## In Vitro Breeding of Intergeneric Triticale and Barley Hybrids

947C0047A Moscow SELEKTSIYA I  
SEMENOVODSTVO in Russian No 1  
Jan-Feb 93 pp 17-19

[Article by V.S. Girko, S.I. Vasilenko, and N.P. Shubenko; UDC [(633.11+633.14)+633.16]:57.086.83]

[Abstract] In 1991, intergeneric hybrids of hexaploid ( $2n = 42$ ) triticale and diploid ( $2n = 14$ ) barley were bred through a culture of immature inflorescences from two constant lines of triticale, i.e., (6TA 502 x Rosner) x AD 206 and TPG 2333, and the experimental winter barley line Bemir 2. Further research has been conducted to determine the optimum age of the inflorescence and to identify the respective conditions resulting in more effective callus formation and regeneration during in vitro culture of the study hybrids. Inflorescences of various age (from the setting of the spikelet tubercle to meiosis) and lengths (from 0.8 to 80 mm) were sterilized, divided into small segments measuring 1-2 mm each, and placed in agar-treated Murashige-Skoog medium supplemented with 2,4-D (2.5 mg/l). The inflorescences were cultured at 28°C. Every 2-3 weeks, they were subcultured in modified media with a graduated decrease in the concentration of 2,4-D or replacement of 2,4-D in the medium by 6-BAP (0.5 mg/l),  $\alpha$ -NUC (0.2 mg/l), and casein hydrolysate (1 g/l). To regenerate plants, the callus tissue was placed in a lit climate chamber with a temperature of 26°C and relative humidity of 70 percent. Callus incubation was observed 4-8 days after explantation and was most active, i.e., nearly 100 percent effective, in those inflorescences that were 20-40 mm long and in the pre-meiosis stage of development. Different types of callus were observed to form depending on the development of the explant in the starting medium. Embryoid-like structures grew most often in the hormone-free medium. Depending on the stage of the inflorescence's development, the number of plants regenerated per explant ranged from 1.4 to 64.6. Several of the calluses in the experiments remained capable of morphogenesis for 10 months. The appearance of embryoid-like structures from callus tissue formed by immature inflorescences and their development into plants were taken as confirmation of the possibility of breeding the said intergeneric hybrids by somatic embryogenesis. Table 1; references 11: 3 Russian, 8 Western.

## Zvezda Winter Wheat

947C0047B Moscow SELEKTSIYA I  
SEMENOVODSTVO in Russian No 1  
Jan-Feb 93 pp 37-40

[Article by N.N. Kondratyeva and A.A. Kondratyev, candidates of agricultural sciences, Moscow Agriculture Academy imeni K.A. Timiryazev; UDC 633.111.1"324": 631.526.32]

[Abstract] Zvezda [Star] is the first winter wheat of its type obtained at the Timiryazev Agriculture Academy by distant hybridization using graduated crosses  $F_1$  [*Triticum durum* (Kharkov 46) x *Agropyron glaucum*] x *T. aestivum*  $F_1$  (Mironovskaya 808 x Lyutesens 329). Since 1992, it has been regionalized in the Moscow Oblast. It is of the variety lutescens. Its spike is cylindrical and of average length and compactness. Its glume is oval with weakly pronounced venation. Its teeth are short and straight, and its grain is oval with a medium stria. The variety has not yet been studied genetically. According to unpublished data, it is a hexaploid form. Zvezda is distinguished by its potentially high productivity. Experiments performed by researchers at the Timiryazev Agriculture Academy and state tests have established Zvezda yields of 8.5-8.7 metric tons/hectare in the Kiev Oblast and Lithuania. In comparative tests conducted in 1987-1991 in the Moscow Oblast, Zvezda yields averaged 5.04 metric tons/hectare over the 5-year period as opposed to an average yield of 4.43 metric tons/hectare for the standard Zarya wheat. In commercial tests conducted in 1990, Zvezda again outperformed Zarya (6.16 versus 2.36 metric tons/hectare). Zvezda's main advantage over standard varieties is its high (albeit not 100 percent) resistance to damping-off. Zvezda is also distinguished from standard wheat varieties from the standpoint of its growth and development rate, which is very close to that of wheat grass. Under favorable conditions, the central part of its spike has up to 6-8 caryopses in each spikelet, which is 35-40 percent higher than in Zarya and Mironovskaya 808. Given this grain content in each spike, 1,000 grains naturally weigh less than in standard varieties and amount to 35-37 g. According to data from the All-Russian State Commission on Agricultural Crop Variety Testing, Zvezda's frost resistance may be characterized as average. Field observations in the extreme winters of 1984-85 and 1986-87 indicate that it possesses higher-than-average frost resistance, however. These contradictory frost resistance data are due, above all, to the biological peculiarities of the variety. Tests have shown Zvezda to be particularly susceptible to diseases when given high doses of nitrogen fertilizers, especially late in the season. Herbicides and retardants also appear to reduce Zvezda's immunity significantly. Its grain possesses good bread-baking properties. Its gluten quality and a number of other indicators make it perhaps superior to even Mironovskaya 808. Table 1.

## Saratovskaya 58 Spring Wheat

947C0047C Moscow SELEKTSIYA I  
SEMENOVODSTVO in Russian No 1  
Jan-Feb 93 pp 40-41

[Article by L.G. Ilina, A.N. Galkin, doctor of agricultural sciences, and A.I. Kuzmenko, candidate of agricultural sciences, Slita Polvolzhya Scientific Production Association; UDC 633.111.1"321":631.526.32]

[Abstract] The variety Saratovskaya 58 was developed at the Scientific Research Institute Agriculture of the Southeast by graduated hybridization. The starting plant was selected from the population of the last cross of

Saratovskaya 46 x Saratovskaya 39. It has been regionalized in regions I and III of the Saratov Oblast since 1991 and in the oblast's II region since 1992. It is of the variety lutescens. The spike is cylindrical and of average compactness. Its glume is of average size, and the tooth of its glume is short. The grain is red, oval, and glassy. A total of 1,000 grains weighs 35.9 g. Saratovskaya 58 is a medium-maturing variety, with a growth period averaging 84 days and with a period of 45 days from the appearance of shoots to the heading stage, which is practically on a par with the standard Saratovskaya 46. Saratovskaya 58 is more drought resistant than the latter and thus provides a more stable yield from year to year under the conditions of the right bank of the central lands along the Volga. The upper leaves of Saratovskaya 58 have a higher water retention capability than Saratovskaya 46. When compared with varieties previously regionalized in the said region, Saratovskaya 58 has a higher multiyear yield: In tests conducted over a 3-year period at government variety-testing sections in the Saratov Oblast, Saratovskaya 58 averaged 2.1 metric tons per hectare versus 1.8 metric tons per hectare for the standard. In commercial tests conducted in 1989 at the Kolkhoz imeni N.G. Chernyshevskiy in the Novoburasskiy Rayon of the Saratov Oblast, the yield of Saratovskaya 58 was 16 percent higher than that of Saratovskaya 46. Saratovskaya 58 is virtually completely resistant to smut and is resistant to sprouting of the grain (in comparative tests, only 0.2 percent of Saratovskaya 58 grains sprouted versus 30.5 percent of Saratovskaya 46 grains). From a grain quality standpoint, Saratovskaya 58 is a hard wheat, and from the standpoints of gluten and protein content, it is somewhat superior to the best hard wheat (Saratovskaya 29). Saratovskaya 58 has a higher gluten content than the standard Saratovskaya 46 and is in quality group 1. Like all hard wheat varieties, Saratovskaya 58 must be raised in rather fertile soil that is free of weeds, and it must be sown as early as possible in moist, well-prepared soil at a rate of 120-150 kilograms of seed per hectare. Table 1.

#### New Varieties of Soft Spring Wheat

947C0047D Moscow *SELEKTSIYA I SEMENOVOZDSTVO* in Russian No 1 Jan-Feb 93 pp 42-43

[Article by I.A. Saurmelkh, I.A. Saumelkh, candidate of agricultural sciences, Kustanay Scientific Production Association; UDC 633.111.1"321":631.526.32]

[Abstract] The spring wheat variety Karabalykskaya 85 was developed at the Karabalyk Agricultural Test Station at the Kustanay Agricultural Scientific Research Institute by the method of individual seed selection from the hybrid population Cesium 51 x Saratovskaya 39. It has been regionalized in the Chelyabinsk Oblast since 1991. Karabalykskaya 85 is of the variety lutescens. Its glume is shaped like an elongated egg with pronounced venation, and its tooth is short, straight, and blunt. Its grain is oval, glassy, and of a semiglassy consistency, and 1,000 grains weigh 32-36 g. It is a medium-maturing variety that ripens at the same time as Saratovskaya 39. It has average

resistance to damping-off and has a rather high potential productivity that averages 3.46 metric tons/hectare, which is 0.31 metric tons/hectare higher than the standard. The results of commercial tests of Karabalykskaya 85 at various sovkhozes were fairly good: At the Petropavlovsk sovkhoz in the Upper Ural Rayon of the Saratov Oblast, its grain yield was twice that of Saratovskaya 29. Its brown rust resistance is close to that of the standard, its susceptibility to root rot is somewhat lower than that of other regionalized varieties, and it is resistant to smut. The processing qualities of the grain of Karabalykskaya 85 are high and meet the requirements set for hard wheat grain. Karabalykskaya 85 should be sowed at the optimum time for given soil/climate zones at a rate of 4.0-5.0 million seeds/hectare. The soft spring wheat variety Erythrospermum 35 was developed by a team at the Karabalyk Agricultural Test station at the Kustanay Agricultural Scientific Research Center and Kazakh Grain Farming Scientific Research Institute by the method of individual selection from the hybrid population Erythrospermum 29/70-19 x Lutescens 26/67-211. It has been regionalized in the Kustanay, Kokchetav, Karaganda, and Dzhezkanzgan oblasts since 1991. It is of the variety erythrospermum. Its spike is of average length and compactness, and its glume is shaped like an elongated oval with marked venation. The tooth of the glume is of average length, straight, and sharp. The grain is red, semielongated, and over average size (1,000 grains weigh 34-40 g). Erythrospermum 35 is a medium-maturing variety that matures 6-8 days later than the standard Saratovskaya 29. It has average resistance to damping-off. In comparative variety tests, Erythrospermum 35 outyielded the standard by 0.65 metric tons/hectare at an average level of 3.3 metric tons/hectare (the maximum yield of 5.4 metric tons/hectare was achieved in 1985). It also demonstrated good results in commercial tests (a yield of 0.67 metric tons/hectare, which was twice as high as the yield of Saratovskaya 29). Erythrospermum 35 is highly resistant to damping-off both under natural conditions and against the background of an artificial infection. During the years of the study, its rate of susceptibility to this disease did not exceed 6-8 percent, while the susceptibility of Saratovskaya 29 was between 34 and 63 percent. Erythrospermum 35 is about as susceptible to rust as Saratovskaya 29, but its grain is more resistant to sprouting than the standard varieties, and it is less susceptible to root rot than other regionalized varieties. It should be sowed late (after 25 May) at a rate of 4-5 million seeds/hectare.

#### MEDICINE AND PUBLIC HEALTH

##### Birth Rate, Maternal Health Decline

947C0041A Moscow *ROSSIYA* in Russian 2-8 Jun 93 p 7

[Interview with Olga Frolova, professor and department head, Sociomedical and Epidemiological Research Department, Obstetrics, Gynecology, and Perinatology Scientific Center, Academy of Medical Sciences, by ROSSIYA correspondent Genadiy Shalayev under the "Firsthand"

**rubic: "Caucasus Gives Birth; Good for All of Russia"; first paragraph is boldface ROSSIYA introduction]**

**[Text] Professor Olga Grigoryevna Frolova, head of the Sociomedical and Epidemiological Research Department, Obstetrics, Gynecology, and Perinatology Scientific Center, Academy of Medical Sciences, responded to the questions of our ROSSIYA correspondent.**

[Shalayev] Olga Grigoryevna, it seems like Russian women have stopped giving birth. Young mothers with baby carriages have become a rarity, especially in the cities. What does this say about science?

[Frolov] There has been a landslide drop in the birth rate. Population growth is falling sharply. In 1989, 18.2 children were born for every thousand persons. In 1990 the figure dropped to 14.6 children, and in 1991 it dropped to only 12. A small increase in population throughout Russia as a whole is being achieved thanks to the Northern Caucasus region, the Eastern Siberia region, and to a lesser extent the Far Eastern region. The absolute indicators are decreasing, however.

Let's open the handbook of the Russian Federation State Committee on Statistics. In the northwestern region, for example, the number of deaths has exceeded the number of births by 13,000, and in the central region, deaths have exceeded births by 60,000. In a year in Moscow, 94,000 have been born and 114,200 have died. That is too rapid a population loss.

[Shalayev] And how is the pattern emerging with respect to age groups?

[Frolov] There has been a decrease in birth rate throughout all age groups, even in the periods from 20 to 24 and from 25 to 29 years. And that is the time of greatest reproductive activity. As far as those who are not yet 20 are concerned, they worry us greatly because they are a group that is very vulnerable from a social standpoint. In addition, their sexual activity, coupled with disregard of modern contraceptive methods and just simple ignorance of them, has led to an increase in the number of abortions and unplanned births that have resulted in a multitude of problems.

And there is yet another suppressing force—the ratio of the number of marriages and divorces. In Russia as a whole in 1991 divorces were registered in more than 40 percent of families. In Moscow the situation is even worse: More than half of all families divorce.

[Shalayev] Have you not tried to explain what is inhibiting maternal instinct and interfering with the idea of having children in a family?

[Frolov] We have tried. We conducted a suitable survey of Moscow women. It turned out that one in five women gives birth only because she is at the critical age of 30 years and cannot wait any longer. As far as social problems are

concerned, 56 percent of Moscow residents polled are not having families out of material considerations: 60 percent because of a shortage of products and 80 percent because of difficulties in feeding and caring for their children. That was a year ago. This year we are preparing to repeat the study. Perhaps Russians have somehow recovered from the socioeconomic shock. Although we are not entertaining any particular illusions.

[Shalayev] And well, what about those who are giving birth? Is everything all right for them?

[Frolov] Here are the results of yet another study recently conducted in accordance with the modern method of evaluating the health status of pregnant women. Only one in four turned out to be healthy. This naturally affects the health of children. Only 28 percent of infants discharged from the obstetric hospital are healthy; 41 percent have some sort of abnormality, and 31 percent are at increased risk from a health standpoint. Of the latter group, only 29 percent remain healthy for their first year of life. Add the well-known quality of our medicine to this...

[Shalayev] What do the statistics say about maternal mortality during childbirth?

[Frolov] It is unfortunately increasing. According to the State Committee on Statistics, there were 47.4 deaths per 100,000 childbirths in 1990 and already 52.4 by 1991. In our country maternal mortality is now "miscalculated" according to World Health Organization indicators. They count all women who have died from medical and illegal abortions and from premature and timely births and within 42 days of giving birth. In the United States, for example, this indicator amounts to 7.2. In Finland it is 6.6, in France it is 10.9, and in Japan it is 12. Sweden has the lowest maternal mortality at 2.9. In Russia there has also been an increase in infant mortality, when children under 1 year of age die.

[Shalayev] What can be done?

[Frolov] In Russia a special family planning program has been developed, and budget funds have already been allocated for it. A federal program to reduce maternal mortality is also being prepared. But it can only provide general arrangements. We have taken the maternal mortality statistic in its dynamics and asked a computer what the indicator is like in individual territories. It turned out that a minimum of six regional programs are needed. A number of territories, such as the Kemerovo Oblast and Tuva Republic, have a high maternal mortality that has remained stable. In other regions it is high or average but is moderating. There trend has been toward a decrease in Tumen, the Irkutsk Oblast, and Moscow. There are regions with a low indicator, let's say the Krasnoyarsk Kray, Karelia, and Mordovia. In a word, a differential approach is needed: In one place, the fight against toxicosis must be intensified; in another, special attention must be paid to family planning.

**Anti-Abortion Movement in Russia**  
947C0041B Moscow ROSSIYA in Russian  
2-8 Jun 93 p 7

[Article by Galina Toktaliyeva under the "Our Sins" rubric: "And the Madonna Walked After the Israelite: In Russia today the number of abortions is twice that of childbirths"]

[Text] Abortion was never a sovereign problem of the inherited estate of obstetrics and gynecology. Reflected in it, as in a microcosm, is the trouble of the nation, providing a foundation for the contradictions regarding the coming demographic Apocalypse. The question of artificial termination of pregnancy has always been a question of belief. Christian teaching, like Islam, considers this sin one of the gravest.

According to data from the Social Demography Center of the Russian Academy of Sciences, the country's population will decrease to 147 million by the end of the millennium: the death rate will surpass the birth rate by an average of 1 million persons each year.

"Abortion has been the main problem ravaging our land for more than 70 years," states Professor I. Guzov, leader of the Russian Right to Life Movement. "It was thrust upon us by the Russian Bolsheviks, and only after rejecting it can the country be reborn."

In fact, the mass nature of artificial terminations has had a noticeable effect on the demographic situation. But other factors are destabilizing it as well. Let us say, from the standpoint of the child mortality level, we are far outdistancing the developed countries of the West, and even by the most cautious estimates, this indicator is 4 to 6 times higher than the "civilized" indicator. In recent years, thanks to paid medicine, the situation has been complicated by physicians' mercenary thinking.

The movement against abortion arose in Russia with the active support of Western religious organizations, particularly the Dutch organization Rainbow. In its actions, Right to Life will not go as far as what I. Guzov considers to be the "extremists of the Western organization," who picket gynecological clinics and chain themselves to abortion tables. "Our main task is to inform Russian women of the truth about abortions," he continues.

At the same time, there are organizations such as the philanthropic fund Good Hope, which in addition to performing educational work, tries to provide specific referral assistance to women who have decided to give birth despite their grave material and family conditions. Religious communities from abroad send them, let's say, sewing machines and material so as to help the future parents or single mothers earn a slice of bread for themselves.

L. Lyubarskaya, chairperson of Good Hope, told of how, having five children, she took ill. The physicians could not cure her, and her husband drove her to a monastery. An old monk who had taken vows of schema asked, "How many children do you have little mother?" "Five." "And

how many years have you been married?" "Sixteen." "That is the reason why you are ill. You have too few children." The women soon gave birth and recovered. Now she has eight children....

But can the church help every child-loving pregnant woman who has been left without the resources to exist? As is well known, the road to Hell is paved with good intentions. "The church is poor, and philanthropic aid to the fund from abroad is simply miserable," says L. Lyubarskaya. "But we are trying as hard as we can to make mothers' lives easier."

**Medilyuks Cooperative Obstetrical Center**  
947C0041C Moscow ROSSIYA in Russian  
2-8 Jun 93 p 7

[Article by Gennadiy Aleksandrov under the "Money Can't Buy Everything" rubric: "The Magnificent Six"]

[Text] "Treated at no charge—treated to no purpose." This homespun sentence, popular in the recent socialist past, was evidently first spoken by some humorist after vain attempts to restore his health at a public hospital. And it was immediately seized by the broad masses of patients and physicians: Both knew that you can only hope for qualified and quality medical care after you transfer some amount of good cognac from a slack wine store to the physician's office.

Now other times have come upon us, and one of the main achievements of socialism, free medicine, is gradually lowering its position in favor of medical care requiring payment.

Well, many of our fellow country women know what it means to give birth for free in a conventional Soviet—I beg your pardon—Russian maternity hospital. But if it were for money? Would it really be more pleasant?

An employee of the Medilyuks, a medical cooperative that I randomly selected from a directory and that is affiliated with the Obstetrics, Gynecology, and Perinatology Scientific Center, who wishes to remain anonymous shared the following information.

The Medilyuks rents a building at the center. The cooperative has single- and double-occupancy rooms. There is one nurse and two physicians for every four women. There is one pediatric nurse and physician for every four infants. Each infant compartment contains one newborn.

And in the center's free-care department, women lie literally up against the wall in six- to eight-bed rooms, each infant compartment holds six infants, and there is one physician and two nurses for 40 women giving birth and one physician and one nurse for 40 infants.

Among the other advantages of births for payment, the Medilyuks workers list single-use instruments. But the bed linens are laundered in the common laundry center. In the cooperative there are individual meals at a cost of about 1,000 rubles a day (of that amount, 200 rubles goes for the cook's salary), and food is bought to the room.

But the main thing is that here births occur in a separate room in the presence of a physician, midwife, hospital attendant, and anesthesiologist. The medical personnel, as my anonymous informant emphasized, have had at least 12 years of work experience. The physicians are all candidates and doctors of medicine from the very same Scientific Center. They "treat" in their off time.

And now about prices. First visits, depending on the physician's academic degree, cost a mother-to-be about 3,000 to 3,500 rubles. Repeat visits are less expensive—only 2,000-2,500. Service for the course of a week in cases of physiological (that is, normal) births costs 150,000 rubles. In cases of pathological births and cesarean section, the cost is 50 percent higher. But a mother giving birth will remain in the hospital for 10-11 days.

"Is this really expensive?" the cooperative employee asked me. If you consider the mad course of the dollar, of course it isn't. Normal births cost on the order of 150 "greenbacks." But if you take the average Russia salary, not exactly every woman will be lining up at the Mediliuks. But in actuality there is a line. The cooperative can only service six women giving birth at a time—that is the number of beds.

Not every woman can end up as part of the "magnificent six": Only women who have reached their 37th week of pregnancy and who have no type of infection can enter the Mediliuks. And if you are a woman who has some pathology and there is no guarantee of a live birth, you cannot give birth in the cooperative for any amount of money. In the normal way and in the public hospital, please.

It seems that the receiving physicians do not want to risk the name of their precious enterprise. And indeed, I repeat that they are the same people who deliver babies during the day free of charge as employees of the government medical institution. Two or three shifts in the cooperative can cover their monthly government salary.

According to this scheme, free medicine is doomed to obscurity. But medical care requiring payment does not offer any guarantees. Everything will still be "as with them." Really, people turn to medical offices requiring payment in the hope of receiving the full attention and qualified assistance of a physician—something they are deprived of in government polyclinics and hospitals. They go there, and they meet the very same specialists. This is all strange....But it is nevertheless necessary to give birth. "Think for yourself, decide for yourself" when and how.

#### Child Health Status in Intensive Agricultural Chemicalization Areas

947C0032A Moscow GIGIYENA I SANITARIYA  
in Russian No 1 Jan 93 pp 49-50

[Article by L.V. Vasilos, A.F. Vasilos, P.M. Stratulat, A.V. Gorshkov, A.P. Maksimchuk, G.Sh. Voronko, Scientific Research Institute of Maternity and Childhood Protection and Scientific Research Institute of Preventive and Clinical Medicine, Kishinev; UDC 614.7:615.285.7-074]

[Abstract] The issue of the real danger posed by chemical compounds used in agriculture, especially in areas whose agricultural production structure determines their high territorial pesticide burden per unit of arable land, is addressed against the backdrop of the use of chemicals on an increasing scale, and an attempt is made to examine the dependence of the child health indices on the territorial pesticide burden, investigate the likely mechanisms of its pathogenic action, and develop preventive measures. To this end, the state of child health in three rural settlements with very different pesticide usage rates (1:6:13 or 3.74, 22.1, and 49.0 kg/ha for the active ingredient) is assessed, and the child health status is evaluated by a complex of basic indicators. Morbidity data are obtained by examining diagnoses for the past three years for 5,363 children, including perinatal infant pathology. The child complex physical development indices from base villages, the child health group distribution in villages with equal agricultural chemicalization rates, and the metabolic status of lipid child health systems in base villages ( $M+/-m$ ) are summarized. The outcome of cytochemical studies of the peripheral blood leukocytes' enzymatic activity attests to unfavorable structural and functional shifts under the effect of various pesticide burden levels. Parallel studies of the metabolic status of the lipid systems and lipid peroxidation attest to profound changes at earlier immune response stages under the effect of pesticide burdens. The findings confirm that in the areas of high chemical usage, the physical development of children lags while the incidence of development disharmony and retardation is high. The percentage of healthy children in these zones is lower and the number of children with chronic diseases is higher. An increase in the chemical use is directly related to the total morbidity and perinatal pathology as well as latent impairments in the protective and adaptation functions of the organism. Tables 3; references 6.

#### Certain Issues of Environmental Pollution, Public Health Status in Georgia

947C0032B Moscow GIGIYENA I SANITARIYA  
in Russian No 1 Jan 93 pp 63-64

[Article by G.V. Abdushelishvili, A.A. Gogoli, M.N. Mamatsashvili, R.Ye. Khazaradze, G.G. Chinchaladze, Public Health and Hygiene Institute imeni G.M. Natadze at the Social Security Ministry of Georgia, Tbilisi; UDC 614.7(479.22)]

[Abstract] The issue of public health is considered against the background of environmental pollution and environmental protection, and the increasing role of medical and biological research for preventing unfavorable consequence of industrial pollution is stressed. It is noted that the level of industrial discharges doubles every 8-10 years while 18-20% of all public health expenditures are related to diseases caused by contaminated atmospheric air alone. Due to the concern about the long-term effect of toxic agent inhalation, the environmental factors are examined in a number of Georgian towns and cities, e.g., Tbilisi, Batumi, Zestafoni, Rustavi, Sagaredzho, etc. The study shows that contamination in four out of five cities is

extreme due to inefficient discharge treatment, poor vehicle emission control, inadequate tree planting, and unsatisfactory street cleaning. Shortcomings in waste water treatment in the above cities and the resulting contamination of the Black Sea are noted. A study of population morbidity confirms the unfavorable effect of atmospheric contamination on the public health status and makes it possible to establish a statistically reliable correlation between the total atmospheric air contamination index P and population health levels in the administrative territories under study of  $r=0.69$ . The findings determine the principal emphasis and character of efforts aimed at improving public health and reducing the demand for medical assistance; these measures basically amount to consistent implementation of deliberate measures aimed at improving the air quality.

#### Combined Effect of Organophosphorous Pesticide DDVP and Ethanol

947C0032C Moscow *GIGIYENA I SANITARIYA*  
in Russian No 1 Jan 93 pp 64-66

[Article by V.N. Karpenko, M.N. Didenko, I.D. Tashker, N.K. Sokolova, Kiev Scientific Research Institute of Occupational Safety and Health; UDC 616.33/.34-02: [547.262+615.285.7]-07]

[Abstract] The combined effect of ethanol and pesticides, particularly ethanol's ability to aggravate the toxic effect of pesticide, is discussed, and the combined effect of 0,0-dimethyl-0-(2-2-dichlorovinyl) phosphate (DDVP) and ethanol is investigated. To this end, an experiment is carried out on 84 male rats with a mean weight of 220-240 g separated into six groups (with one control group) with different exposures to one or both agents. The condition of the test animals was ascertained by examining a complex of physiological and biochemical indicators and pathomorphological research. The status indicators of white rats after oral administration of DDVP and ethanol is summarized; the study indicates that the effect of ethanol upsets the behavioral reactions of the animals who displayed a tendency toward a decreased spontaneous motor activity (SDA) and a considerable increase in the latent period of cognitive reflex (LPPR); the summation threshold index (SPP) increased only in rats who received ethanol alone. A study of the mixed function oxidase (OSF) shows that it is induced somewhat in animals exposed to ethanol or the

ethanol-and-DDVP mixture. The conclusion is drawn that the extent to which the two substances and their combinations affect the test animals increases in the following sequence: ethanol, DDVP, DDVP+ethanol, and ethanol and DDVP+ethanol against the background of alcoholization. Thus, given contact with an organophosphorous pesticide, ethanol may have an unfavorable aggravating effect, especially if taken regularly. Tables 1; references 10: 9 Russian, 1 Western.

#### Basic Principles for Selecting Priority Pollutants in Analyzing Critical Environmental Toxicological Situations

947C0032D Moscow *GIGIYENA I SANITARIYA*  
in Russian No 1 Jan 93 pp 66-68

[Article by T.L. Nesterova, E.I. Babkina, A.V. Konoplev, G.V. Chernik, Experimental Meteorology Institute, Odninsk; UDC 614.72+614.77]-074]

[Abstract] The wide-ranging use of toxic chemical substances and materials leading to an increasingly frequent development of the so-called ecotoxicological situations (ETS) due to the discharge of dangerous chemical substances into the environment (OS) is discussed, and the impracticability and inexpediency of analyzing all of most of the close to 50 thousand organic and hetero-organic compounds is noted. This necessitates selection of priority pollutants which must be analyzed in critical ecotoxicological situations (KETS) when the contamination sources are unknown and there are no data on the chemical compounds which led to the critical ecotoxicological situation. The principal criteria which determine the chemical substance priority (or ranking) depend on the medium for which its danger is being assessed. The danger classes of organic compounds and danger classes of organic compounds based on their persistence and sorption ability in the soil are summarized; altogether, five classes are identified on the basis of lethal doses ( $LD_{50}$ ) and lethal concentrations ( $CL_{50}$ ) as well as maximum permissible concentrations (PDK) established by the Public Health Ministry. The study made it possible to identify the principal list containing 82 substances and eight compound classes and a supplementary list of 47 compounds which are to be analyzed in the soil during critical ecotoxicological situations. Tables 2; references 16: 12 Russian, 4 Western.

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